NUCLEAR WEAPONS' FALLOUT COMPENSATION

JOINT HEARING

BEFORE THE

COMMITTEE ON LABOR AND HUMAN RESOURCES

AND THE

SUBCOMMITTEE ON AGENCY ADMINISTRATION

OF THE

COMMITTEE ON THE JUDICIARY UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

SECOND SESSION

ON

EXAMINATION OF THE POTENTIAL DANGERS OF AND LIABILITY FOR RADIOACTIVE EMISSIONS RESULTING FROM THE GOVERNMENT'S WEAPONS TESTING PROGRAM

MARCH 12, 1982

Printed for the use of the Committee on Labor and Human Resources and the Subcommittee on Agency Administration of the Committee on the Judiciary

U.S. GOVERNMENT PRINTING OFFICE

97-779 O WASHINGTON: 1982

S521-73
S541-64

COMMITTEE ON LABOR AND HUMAN RESOURCES

ORRIN G. HATCH, Utah, *Chairman*

ROBERT T. STAFFORD, Vermont
DAN QUAYLE, Indiana
PAULA HAWKINS, Florida
DON NICKLES, Oklahoma
LOWELL P. WEICKER, JR., Connecticut
GORDON J. HUMPHREY, New Hampshire
JEREMIAH DENTON, Alabama
JOHN P. EAST, North Carolina

EDWARD M. KENNEDY, Massachusetts
JENNINGS RANDOLPH, West Virginia
CLAIBORNE PELL, Rhode Island
THOMAS F. EAGLETON, Missouri
DONALD W. RIEGLE, JR., Michigan
HOWARD M. METZENBAUM, Ohio

GEORGE W. PRITTS, JR., *Chief Counsel*
RENN M. PATCH, *Staff Director and General Counsel*
LAWRENCE C. HOROWITZ, M.D., *Minority Staff Director*

COMMITTEE ON THE JUDICIARY

STROM THURMOND, South Carolina, *Chairman*

CHARLES McC. MATHIAS, JR., Maryland
PAUL LAXALT, Nevada
ORRIN G. HATCH, Utah
ROBERT DOLE, Kansas
ALAN K. SIMPSON, Wyoming
JOHN P. EAST, North Carolina
CHARLES E. GRASSLEY, Iowa
JEREMIAH DENTON, Alabama
ARLEN SPECTER, Pennsylvania

JOSEPH R. BIDEN, JR., Delaware
EDWARD M. KENNEDY, Massachusetts
ROBERT C. BYRD, West Virginia
HOWARD M. METZENBAUM, Ohio
DENNIS DECONCINI, Arizona
PATRICK J. LEAHY, Vermont
MAX BAUCUS, Montana
HOWELL HEFLIN, Alabama

VINTON DEVANE LIDE, *Chief Counsel*
QUENTIN CROMMELIN, JR., *Staff Director*

SUBCOMMITTEE ON AGENCY ADMINISTRATION

CHARLES E. GRASSLEY, Iowa, Chairman

PAUL LAXALT, Nevada
ARLEN SPECTER, Pennsylvania

HOWARD M. METZENBAUM, Ohio
MAX BAUCUS, Montana

JOHN MAXWELL, *Chief Counsel and Staff Director*
HERMAN SCHWARTZ, *Minority Counsel*

CONTENTS

CHRONOLOGICAL LIST OF WITNESSES

FRIDAY, MARCH 12, 1982

	Page
Sinclair, Dr. Warren K., President, National Council on Radiation Protection and Measurement	8
Bond, Dr. Victor P., Associate Director, Brookhaven, and Chairman, Scientific Committee 91, National Council on Radiation Protection and Measurement	25
Jablon, Seymour, National Academy of Sciences and member, Scientific Committee 71, National Council on Radiation Protection and Measurement	39
Wade, Troy E., Deputy Assistant Secretary for Defense Programs, Department of Energy, accompanied by Bruce W. Church, Director of Health Physics, Nevada Operations Office, Department of Energy; and Dr. Lynn R. Anspaugh, section for analysis and assessment environmental sciences division, Lawrence Livermore National Laboratory	60
Griffith, Lt. Gen. Harry A., Director, Defense Nuclear Agency, Department of Defense, accompanied by Dr. David Auton, Operations Resident Analyst; and Robert Brittigan, General Counsel	69
Brandt, Dr. Edward N. Jr., Assistant Secretary, Health and Human Services Administration; accompanied by Gilbert W. Beebe, Ph. D., epidemiologist, NIH-NCI	94
Thompson, John H., Deputy Assistant General Counsel, Veterans' Administration, accompanied by James J. Smith, M.D., Director, Nuclear Medicine, Veterans' Administration, and Ralph Ibson, Deputy Assistant General Counsel, Veterans' Administration	109

STATEMENTS

Bond, Dr. Victor P., Associate Director, Brookhaven, and Chairman, Scientific Committee 91, National Council on Radiation Protection and Measurement	25
Prepared statement	28
Brandt, Dr. Edward N. Jr., Assistant Secretary, Health and Human Services Administration; accompanied by Gilbert W. Beebe, Ph. D., epidemiologist, NIH-NCI	94
Prepared statement	98
Cannon, Hon. Howard W., a U.S. Senator from the State of Nevada, prepared statement	5
Griffith, Lt. Gen. Harry A., Director, Defense Nuclear Agency, Department of Defense, accompanied by Dr. David Auton, Operations Resident Analyst; and Robert Brittigan, General Counsel	69
Prepared statement	71
Jablon, Seymour, National Academy of Sciences and member, Scientific Committee 71, National Council on Radiation Protection and Measurement	39
Prepared statement	43
Sinclair, Dr. Warren K., president, National Council on Radiation Protection and Measurement	8
Prepared statement (with attachments)	11
Thompson, John H., Deputy Assistant General Counsel, Veterans' Administration, accompanied by James J. Smith, M.D., Director, Nuclear Medicine, Veterans' Administration, and Ralph Ibson, Deputy Assistant General Counsel, Veterans' Administration	109
Prepared statement	110

Wade, Troy E., Deputy Assistant Secretary for Defense Programs, Department of Energy, accompanied by Bruce W. Church, Director of Health Physics, Nevada Operations Office, Department of Energy; and Dr. Lynn R. Anspaugh, section for analysis and assessment environmental sciences division, Lawrence Livermore National Laboratory ..... Page 60
Prepared statement 62

ADDITIONAL INFORMATION

Articles, publications, et cetera:
NCRP Reports 58
Studies on the Effects of Radiation on Humans 86

NUCLEAR WEAPONS' FALLOUT COMPENSATION

FRIDAY, MARCH 12, 1982

U.S. SENATE,
COMMITTEE ON LABOR AND HUMAN RESOURCES,
AND SUBCOMMITTEE ON AGENCY ADMINISTRATION,
COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The committee and subcommittee met, pursuant to notice, at 9 a.m., in room 4232, Dirksen Senate Office Building, Senator Orrin G. Hatch (chairman of the committee) presiding.

Present: Senators Hatch and Grassley.

OPENING STATEMENT OF SENATOR HATCH

The CHAIRMAN. The committee will come to order.

During the 96th Congress the Senate Labor and Human Resources Committee, the Senate Judiciary Committee, and the House Interstate and Foreign Commerce Committee conducted extensive hearings on the plight of the people who lived and worked in the shadow of the atmospheric atomic bomb tests that were conducted at the Nevada test site between 1951 and 1963.

In light of what we learned at these hearings, the Labor and Human Resources Committee held a followup hearing last fall to consider a new legislative remedy, S. 1483, the Radiation Exposure Compensation Act of 1981. Because of our hearings, Members of Congress are now sensitive to the problems with which we are now dealing.

I am talking about these earlier atomic tests which exposed people to significant levels of radioactive fallout which left citizens inadequately warned and protected and which have created a situation in which current legal remedies are an inadequate means of redress for the persons whose cancer may well have been caused by the fallout.

I believe the case for legislative action has been amply made. The time has come to determine the nature of that action. The primary objective of today's joint hearing by the Labor and Human Resources Committee and the Senate Agency and Administration Subcommittee is to consider legislation designed so we can perfect the law to remedy the wrongs we uncovered during our earlier hearings.

Much work has been done since those hearings to improve our bill in pursuit of our legislative purpose, which is this: We seek a law that allows the Federal courts to judge fairly the claims the citizens who have believed their cancer to have been caused by radioactive fallout from the Nevada atmospheric nuclear testing pro-

gram. Rendering justice is never easy, especially when these wrongs were committed a long time ago. We must be careful to weigh all of the available scientific evidence. We must also never fail to grant the benefit of the doubt to those citizens who played host to well over 100 nuclear explosions.

In order to construct the proper remedy, we must resolve the problem of the courts in judging the merits of allegations that this person's or that person's cancer was caused by radiation. This problem arises because people get cancer under a variety of circumstances. A radiation-caused cancer is indistinguishable from a cancer of the same type that is not radiation generated. Evidence that radiation causes cancer comes almost exclusively from the science of radioepidemiology, which can tell us whether a population that has been exposed to radiation has developed more cancer than would normally be expected.

However, radioepidemiology cannot tell us which cancer victims have these excess radiation-generated cancers. In short, we sometimes know that people have been hurt, but we cannot tell which people have been hurt. This inability poses a special dilemma to the courts and has been the major obstacle in designing appropriate legislation.

During the October 27, 1981, hearing on S. 1483, Dr. Victor Bond eloquently outlined a solution to this dilemma. Testifying on behalf of the National Council for Radiation Protection and Measurement, he recommended basing any award of damages to a cancer victim on the size of his "attributable risk." That is, base it on the probability that this person developed cancer as a result of his or her prior exposure to radiation.

Radioepidemiology is used to determine these probabilities or attributable risks for every cancer victim. It seems that although this science cannot tell us who has been harmed, it can tell us who most likely was harmed. In this way we can develop a law employing attributable risk so that damages will be awarded to the people who are most likely to have been victimized by the radioactive fallout from the 1951 through 1963 Nevada tests.

I believe using radioepidemiology and attributable risks is the best approach. Through the end of last year and the beginning of this year, my staff has been working with Dr. Bond of the Brookhaven National Laboratory and with Mr. Seymour Jablon of the National Research Council. With the indespensable help of these two scientists we have been able to develop our legislation in what really is a bold and innovative way. We can now focus on those persons most likely harmed by the fallout and assure that these are the people who will be awarded damages.

At the same time, we allow the courts to winnow out those cases with little or no merit. The amount of damages in each case is tied to an actual scientifically quantifiable risk. In this way a sense of proportion is maintained, fairness is insured, and justice will be served.

The new draft of our radiation compensation bill, S. 1483, represents in my opinion solid progress. It represents a cooperative team effort by staff and by scientists within the Federal agencies and within the scientific community at large. I hope we can further that progress this morning.

Dr. Bond, Mr. Jablon, and Dr. Sinclair of the National Council on Radiation Protection and Measurement will all be here this morning. Dr. Bond is the only one here right now, but the other two are on their way. We welcome you, Dr. Bond.

We also have representatives of the administration as well.

The task before us this morning requires mediating a heated national debate over the dangers and liability for radioactive emissions. Any legislation which addresses this issue will have far-reaching implications for the health of our people, the energy resources of our economy, and the defense of our country. Thus we must act deliberately.

Dealing with cases of public liability, the Federal Tort Claims Act is good, but it is not good enough. It was not designed to deal with the type of situation facing cancer victims who lived and worked in the vicinity of the Nevada tests.

Under the current law, the courts cannot make proper use of radioepidemiological evidence. They have no reasonable method for determining a liability for cancer that appears often many years after a hazardous event. So let us reform the law, and if to do so we must confront the issue of radiation and health, let us not shrink from that challenge.

Senator Grassley?

OPENING STATEMENT OF SENATOR GRASSLEY

Senator GRASSLEY. Thank you, Mr. Chairman.

As chairman of the Judiciary Subcommittee on Agency Administration it is my pleasure to join Senator Hatch in chairing this joint Labor-Judiciary hearing on the effects of radioactive testing of nuclear weapons in the 1950's and 1960's. I am hopeful that this hearing, together with past hearings on the topic, will provide us with answers to some critical questions.

Although not absolutely necessary to the scheme of compensation as set forth by this legislation, I want to know from this hearing whether the Government intentionally misled citizenry as to the potentially dangerous effects of the Government's nuclear weapons testing program.

It is also necessary as far as I am concerned to determine whether residents of the alleged radiation fallout site did in fact suffer adverse health effects from radiation exposure.

Finally, it is necessary to determine the Government's responsibility for compensating and restoring to health anyone injured as a consequence of our Government's actions.

National defense was and is a critical factor of preservation in a world that increasingly responds to power rather than principle. However, in striving for power we all too often forget that it is the goal of preservation that we seek to achieve.

If in fact the U.S. Government has harmed Americans through its formerly unchecked development of atomic weapons, we have no choice but to deal responsibly with the human health consequences of any testing program. It is the least we can do to correct a defense testing policy that harmed rather than protected Americans.

However, one aspect of the bill that is of particular interest to the Subcommittee on Agency Administration deals with the intent of the bill to compensate members of the Armed Forces outside the statutory scheme set up through the Veterans' Administration.

My subcommittee will be conducting a hearing later on the application of the *Feres* doctrine to private relief bills. That hearing will be in April. The *Feres* doctrine was enunciated in the 1950 Supreme Court case of *Feres* v. *United States.*

The Supreme Court actually considered three cases in this opinion. The common fact underlying the three cases was that each claimant, while on active duty, sustained injury due to negligence of others in the Armed Forces. The only issue of law raised was whether the Federal Tort Claims Act extended its coverage to one injured incident to his military service. The Court noted enactments by Congress which provide systems of simple, certain, and uniform compensation for injuries or death of those in the armed services.

As noted in the written testimony of the Veterans' Administration, veterans with service-connected cancers may receive VA compensation at rates exceeding $1,100 per month. Veterans also have access to health care at VA hospitals and clinics.

Insofar as the military is concerned, it is my hope that should we find any former military test participant to be suffering from the side effects of exposure to atmospheric testing we utilize the existing congressionally mandated health and recompense schemes available through the VA.

I can think of no reason why we should undermine a system of benefits that is working so well. Again, while we have a duty to compensate Americans who might have been injured by this testing policy, I am hopeful that we will neither disturb a doctrine nor a system that promotes military effectiveness and discipline as well as compensation and health care.

Thank you.

The CHAIRMAN. Thank you, Senator Grassley.

I certainly want to express my appreciation for your statement and for your interest in this subject because it is a serious subject.

At this point we will enter without objection into the record the statement of Senator Howard Cannon.

[The statement referred to follows:]

STATEMENT OF SENATOR HOWARD W. CANNON
CONCERNING THE RADIATION EXPOSURE COMPENSATION ACT, S. 1483

Joint Hearing of the Committee on Labor and Human Resources and
the Committee on the Judiciary

March 12, 1982

The federal government has a moral responsibility to accept the consequences of its actions and to properly compensate the victims of its mistakes. One such group of victims is found among the citizens who were unknowingly subjected to exposure of low-level ionizing radiation as a result of atmospheric testing of nuclear weapons.

These atomic detonations, conducted at the Nevada Test Site in the 1950's and 60's, were an important means for keeping our nation militarily strong. They were supported by me, by residents of my state of Nevada, and by Americans nationwide. Lately, however, after extensive investigation, it has become evident that damages to individuals (the cruel loss of loved ones, the pain and suffering of disease and death, the great expense of prolonged medical treatment) have also resulted from these tests. These damages must now be recognized and ameliorated to the greatest extent possible.

Even though a comprehensive study of the effects of radiation exposure on health, such as mandated in our bill S. 1483, has not yet been conducted, there is no doubt that the rates of several kinds of cancer are much higher among those connected with the Nevada Test Site than among the population at large. One witness at the Congressional hearings held in St. George, Utah--my birthplace--said that over the past ten years he had known of eleven cases of cancer, nine of which were fatal, within 200 yards of his home. This kind of testimony has convinced me that the evidence of a causal link between radiation exposure and certain types of cancer can be established.

BEST COPY AVAILABLE

The federal government's liability to these people stems from its failure to warn those involuntarily subjected to radiation exposure of its possible hazards to health, from its subsequent attempts to cover up increasing evidence of the dangers, and from its inadequate monitoring of radiation exposure. In short, the federal government has not done all it could or should have to protect its citizens and its environment against the dangers created by atmospheric testing of nuclear weapons.

I feel that S. 1483 provides a sensible, prudent way to remedy this situation by establishing an equitable compensation program for those individuals or their survivors who clearly deserve it without unduly burdening the federal government. I wholeheartedly support the proposed program, but I would urge this committee to add a minor amendment to the bill.

As it now stands, those people who will be eligible for compensation under S. 1483 include any persons who have suffered certain kinds of cancer as a result of exposure to radiation during the period of atmospheric testing. This group includes residents, veterans, and test site workers. I would like to add to this list another small group of workers who absorbed radiation at the Nevada Test Site during "venting", the release of radioactive materials into the atmosphere from underground tests. Since the Baneberry shots in 1970, much better control of underground testing has prevented unplanned "venting"; but, prior to that time, there were approximately 30 such episodes. Since S. 1483 deals specifically with the Nevada Test Site, I feel that it is appropriate to include these workers under its provisions. Although the tests were underground, the radiation was released into the air and can be considered fallout.

Surely these workers are entitled to be compensated under the terms of S. 1483 for the same reasons as the other groups of individuals covered. They suffered radiation exposure which subjected them to a higher than normal risk of cancer; the government did not prevent their exposure when it could have; and they have no other accessible means

BEST COPY AVAILABLE

of securing compensation. This last point was made especially clear with the recent decision by Federal District Judge Roger Foley in Prescott v. United States where he ruled that radiation-related illnesses were not and have never been covered by workmans compensation for any individual employed at the Nevada Test Site.

The total number of individuals who could seek damages under this amendment is quite small. Since only a few of the additionally covered workers have actually contracted cancer, the absolute number of additional recipients of compensation would be minimal. Their inclusion in the bill would have only a minor impact on the federal budget; yet, it would make a major difference in the lives of these workers who have suffered at the hands of their own government.

In closing, I would again like to emphasize the careful crafting and revising of this bill in its attempt to produce a rational response to a serious problem. This bill is not meant to represent either a pro-nuclear or anti-nuclear position. Rather, it is an attempt to right a previous wrong done by the government. It is equitable but not excessive. Not all health conditions which some believe related to radiation exposure are included; only those about which there is general agreement within the scientific community. There is a dollar limit on the amount of compensation to which any individual is entitled, but people are given the benefit of the doubt in determining their eligibility. And there is a ceiling on the fees which can be paid to the attorneys of those persons seeking compensation.

I am optimistic about the future of S. 1483 and am very pleased with the draft revisions that have been made thus far. While they strengthen and expand the scope of the bill, they also establish a feasible compensation program which should be acceptable even to an administration intent on budget cuts. S. 1483 provides an excellent means for the government to meet its moral obligations to these victims of radiation exposure. And, with the amendment I suggested, I strongly urge its approval by the Committees on Labor and Human Resources and on the Judiciary.

BEST COPY AVAILABLE

The CHAIRMAN. With that, I would like to welcome the National Council on Radiation Protection and Measurement, represented by Dr. Sinclair, Dr. Bond, and Mr. Jablon.

I greatly appreciate the tremendous help that your organization and you people individually have given to my staff and to me in this endeavor.

Dr. Bond, it is good to see you again. As you can see, we followed your wise counsel in revising our legislation. I think that has to be in your honor.

Dr. Sinclair, we will begin with you. Then we will go to Dr. Bond and Mr. Jablon.

STATEMENT OF DR. WARREN K. SINCLAIR, PRESIDENT, NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENT

Dr. SINCLAIR. Thank you very much, Senator Hatch.

My name is Warren Keith Sinclair. I reside at 2900 Ascott Lane in Olney, Md. I have a Ph. D. in physics and a background in biophysics and radiobiology.

I am presently employed as the President of the National Council on Radiation Protection and Measurements, a private, not-for-profit corporation, chartered by the Congress of the United States, which publishes reports on all aspects of radiation protection.

I am on leave from my position of senior biophysicist at Argonne National Laboratory where I was also, until recently, Associate Laboratory Director for Biomedical and Environmental Research and from my position as professor of radiation biology at the University of Chicago, positions I have held for 22 years.

My personal experience in research has included a variety of studies in medical physics with both radionuclides and beam radiation, biophysics and radiobiology on animal and cellular aspects of radiation effects, and in radiation protection and human risk estimation.

I should also say that I am a member of the International Commission on Radiation Units and Measurements, a member of the International Commission on Radiological Protection, and a member of the U.S. delegation to the United Nations Scientific Committee on the Effects of Atomic Radiation.

I would like to present to you some information about the National Council on Radiation Protection and Measurement [NCRP], on whose behalf I am appearing today. It started in 1929 as an advisory committee on X-ray and radium protection, later as a national committee on radiation protection, and finally, since 1964, as the National Council on Radiation Protection and Measurements, a not-for-profit corporation chartered by the Congress of the United States, "to collect, analyze, develop, and disseminate in the public interest information and recommendations about (a) protection against radiation (referred to herein as 'radiation protection'), and (b) radiation measurements, quantities, and units, particularly those concerned with radiation protection." There are, of course, other clauses.

The Council currently consists of 75 members, all experts in their field, and embracing a wide range of disciplines in science

and engineering, and including specialists in nonionizing as well as ionizing radiation.

In addition, there are about 400 additional scientists involved in the work of the 70 or so committees and task groups that are presently active in the NCRP. These persons serve voluntarily, motivated by their interest in the field and a spirit of public service.

The organization is supported by almost 40 collaborating organizations, scientific and medical societies, as well as various branches of the Federal Government and the armed services.

The NCRP produces scientific reports on a wide variety of topics that relate to radiation protection, including, for example, radiobiology—like report 64, assessment of dose to the public, like from natural background report 45, guidance—as for example in pediatric radiology—report 68, on information as for example, report 44 on krypton-85, and its corollary, a report on krypton-85 venting at Three Mile Island, and lastly, for the present, on nonionizing radiation—microwaves—report 67. (See attached list for full titles.)

These reports are produced very carefully, initially by a drafting committee of experts appointed by the Board of Directors of the NCRP. The committee's effort is then reviewed by other experts in the Council and then by the entire Council itself. The 75 members of the Council read what the committee has done, make comments on it, and try to make it the very best at any given time that experts can produce. I think that is important relative to the matters that Dr. Bond and Mr. Jablon will be discussing.

Among the many problems in radiation protection considered by the Board of the NCRP was the question of the compensation of individuals potentially injured by radiation exposure. From time to time members of the NCRP have given individually expert testimony in such cases and found general guidance and principles of procedure in this area sadly lacking.

As long ago as 1979, the Board decided that information available on the estimation of the risks of cancer following a given dose of radiation was probably sufficiently reliable to be used as a base for determining the magnitude of the radiation risk in the case of a given cancer.

Therefore, together with the knowledge of the natural risk of cancer for the age, sex, and locality of the individual, it should be possible to determine what we call the attributable risk or the probability of causation, in other words the percentage likelihood that a given cancer might be due to ionizing radiation as opposed to other possible causes.

The Board therefore decided to set up a scientific committee, known as NCRP Scientific Committee No. 71, on Radiation Exposure and Potentially Related Injury, and chose Dr. Bond as the Chairman because he had studied this question extensively and had actually influenced the Board to adopt this approach.

The members were selected and the committee started to become active late in 1981, even prior to its first meeting in January, 1982. That committee will consider the basis for the probability of causation concept and all the associated physical, biological, and medical facets of the problem.

It will do so, as NCRP committees typically do, in the completely generic sense, that is, it will address the general problem without

reference to specific locales or circumstances, and its work will be reviewed by other experts and by the entire Council of the NCRP.

Dr. Bond, as chairman of that committee, will tell you more about its scope and program.

Before closing my own testimony, I would like to make a few brief remarks about the estimation of risks of cancer following doses of ionizing radiations. The quantitative estimation of these risks is only about 10 years old. Reports of the United Nations Scientific Committee in 1972 and the BEIR Committee of the National Academy of Sciences in the same year, following some earlier attempts, really established the process of estimating risks.

Further reports of the United Nations Committee, in 1977, and the BEIR Committee of 1980 update the earlier information and the material is constantly under revision.

The information comes mainly from the exposure of human beings. (A list of the various different populations from which we make these estimates is attached.)

These populations are examined and reexamined as new information comes forward—for example, in the Japanese population tumors are still increasing as those survivors age—so that our estimates of the radiation risks get better and better with time. However, the number of cancers induced by radiation in any of these populations is small and the natural incidence of cancer is high so that our estimates are always subject to uncertainty.

It is that degree of uncertainty that I wish to emphasize to you; it is one of the reasons why the collective wisdom of committees in making estimates and judgments from them is so important.

These uncertainties must be borne in mind as we consider the base of the probability of causation system that Dr. Bond and Mr. Jablon will be describing to you.

Finally, let me state that we, the NCRP, realize that there are many issues raised by this approach, some of which are not scientific or at least not solely scientific. We pretend to no special knowledge in dealing with the non-scientific issues, such as judgments about percentage levels and amounts of compensation.

However, the NCRP does endorse the basic scientific approach used in this bill. We also understand its broader context with respect to many other exposures to ionizing radiation and perhaps to other pollutants as well. Dr. Bond will comment upon this further.

Thank you very much for your attention, Senator.

[The prepared statement of Dr. Sinclair follows:]

Statement of Warren K. Sinclair

My name is Warren Keith Sinclair. I reside at 2900 Ascott Lane, Olney, Maryland and I have a Ph.D. in Physics and a background in biophysics and radiobiology. I am presently employed as the President of the National Council on Radiation Protection and Measurements a private, not for profit corporation, chartered by the Congress of the United States, which publishes reports on all aspects of radiation protection. I am on leave from my position of Senior Biophysicist at Argonne National Laboratory where I was also until recently Associate Laboratory Director for Biomedical and Environmental Research and from my position as Professor of Radiation Biology at the University of Chicago, positions which I have held for 22 years. My personal experience in research has included a variety of studies in medical physics with both radionuclides and beam radiation, in biophysics and radiobiology on animal and cellular aspects of radiation effects, and in radiation protection and human risk estimation.

I should also say that I am a member of the International Commission on Radiation Units and Measurements, a member of the International Commission on Radiological Protection, and a member of the U. S. Delegation to the United Nations Scientific Committee on the Effects of Atomic Radiation.

I would like to present to you some information about the NCRP on whose behalf I am appearing here today. It started in 1929 first as an advisory committee on x ray and radium protection, later as a National Committee on Radiation Protection and finally, since 1964, as the National Council on Radiation Protection and Measurements, a not for profit corporation chartered by the Congress of the United States, "to collect, analyze, develop, and disseminate in the public interest information and recommendations about (a) protection against radiation (referred to herein as "radiation protection"), and (b) radiation measurements, quantities, and units, particularly those concerned with radiation protection." There are, of course, additional clauses.

The Council currently consists of 75 members, all experts in their field, and embracing a wide range of disciplines in science and engineering and including specialists in nonionizing as well as ionizing radiation. In addition there are about 400 additional scientists involved in the work of the 70 or so committees and task groups that are presently active in the NCRP. These persons serve voluntarily, motivated by their interest in the field and a spirit of public service. The organization is supported by almost 40 collaborating organizations, scientific and medical societies as well as various branches of the federal government and the armed services.

The NCRP produces scientific reports on a wide variety of topics that relate to radiation protection, including, for example, radiobiology - like report 64 - I, assessment of dose to the public, like from natural background report 45 - II, guidance - as for example in pediatric radiology - report 68 - III, on information as for example, report 44 on krypton-85 - IV, and its corollary, a report on krypton-85 venting at Three Mile Island - V, and lastly, for the present, on nonionizing radiation - microwaves - report 67 - VI.

These reports are produced carefully, initially by a drafting committee of experts appointed by the Board of the NCRP and then reviewed critically by other Council experts and finally by all 75 members of the Council. We hope they represent the best that experts can do at any given time.

Among the many problems in radiation protection considered by the Board of NCRP was the question of the compensation for individuals potentially injured by radiation exposure. From time to time members of NCRP have given expert testimony in such cases and found guidance and principles of procedure in this area sadly lacking. As long ago as 1979, the Board decided that information available on estimation of the risks of cancer following a given dose of radiation

was probably sufficiently reliable to be used as a base for determining the magnitude of the radiation risk in the case of a given cancer. Therefore, together with a knowledge of the natural risk of cancer for the age, sex and locality of the individual it should be possible to determine the attributable risk on the percentage likelihood that a given cancer might be due to ionizing radiation as opposed to other possible causes. The Board therefore decided to set up a scientific committee known as SC-71 on "Radiation Exposure and Potentially Related Injury" and chose Dr. Bond as chairman because he had studied this question extensively and actually influenced the Board to adopt this approach. The members were selected and the Committee started to become active late in 1981, even prior to its first meeting in January, 1982. That Committee will consider the basis for the probability of causation concept and all the associated physical, biological and medical facets of the problem. It will do so, as NCRP committees typically do, in the completely generic sense, i.e. it will address the general problem without reference to specific locales or circumstances, and its work will be reviewed by other experts and by the entire Council of the NCRP. Dr. Bond, who is the chairman of that committee, will tell you more about its scope and program.

Before closing my own testimony I would like to make a few brief remarks about the estimation of risks of cancer following doses of ionizing radiations. The quantitative estimation of those risks is only about 10 years old, reports of the United Nations Scientific Committee in 1972 and the BEIR Committee of the National Academy of Sciences here in the same year, started the process. Further reports of the United Nations Committee in 1977 - VII, and the BEIR Committee of 1980 - VIII, update the earlier information and the material is constantly under revision. The information comes mainly from human beings exposed to ionizing radiation - IX.

These populations are examined and reexamined as new information comes forward (for example, tumors are still increasing in the aging Japanese survivors of the atomic bombs so our estimates get better and better with time). However, the number of cancers induced by radiation in any of these populations is small and the natural incidence of cancer is high so that our estimates are always subject to uncertainty. It is that degree of uncertainty that I wish to emphasize to you; it is one of the reasons why the collective wisdom of committees in making estimates and judgements from them is so important.

These uncertainties must be born in mind as we consider the base of the probability of causation system that Dr. Bond and Mr. Jablon will be describing to you.

Finally, let me state that we realize there are many issues raised by this approach, some of which are not scientific or not solely scientific. We pretend to no special knowledge in dealing with the non-scientific issues, such as judgements about percentage levels and amounts of compensation. However, the NCRP does endorse the basic scientific approach used in this bill. We also understand its broader context with respect to many other exposures to ionizing radiation and perhaps to other pollutants as well and Dr. Bond will comment upon this further.

List of Illustrations

I Report 64

II Report 45

III Report 68

IV Report 44

V Report TMI - Kr^{85}

VI Report 67

VII UNSCEAR 1977 Report

VIII BEIR Report 1980

IX Sources of Human Exposure Information

NCRP REPORT No. 64

INFLUENCE OF DOSE AND ITS DISTRIBUTION IN TIME ON DOSE-RESPONSE RELATIONSHIPS FOR LOW-LET RADIATIONS

NCRP

National Council on Radiation Protection and Measurements

NCRP REPORT No. 45

NATURAL BACKGROUND RADIATION IN THE UNITED STATES

NCRP

National Council on Radiation Protection and Measurements

NCRP REPORT No. 68

RADIATION PROTECTION IN PEDIATRIC RADIOLOGY

NCRP

National Council on Radiation Protection and Measurements

NCRP REPORT No. 44

KRYPTON-85 IN THE ATMOSPHERE— Accumulation, Biological Significance, and Control Technology

NCRP

National Council on Radiation Protection and Measurements

KRYPTON-85 IN THE ATMOSPHERE—WITH SPECIFIC REFERENCE TO THE PUBLIC HEALTH SIGNIFICANCE OF THE PROPOSED CONTROLLED RELEASE AT THREE MILE ISLAND

May 16, 1980

NCRP

National Council on Radiation Protection and Measurements

NCRP REPORT No. 67

RADIOFREQUENCY ELECTROMAGNETIC FIELDS

Properties, Quantities and Units, Biophysical Interaction, and Measurements

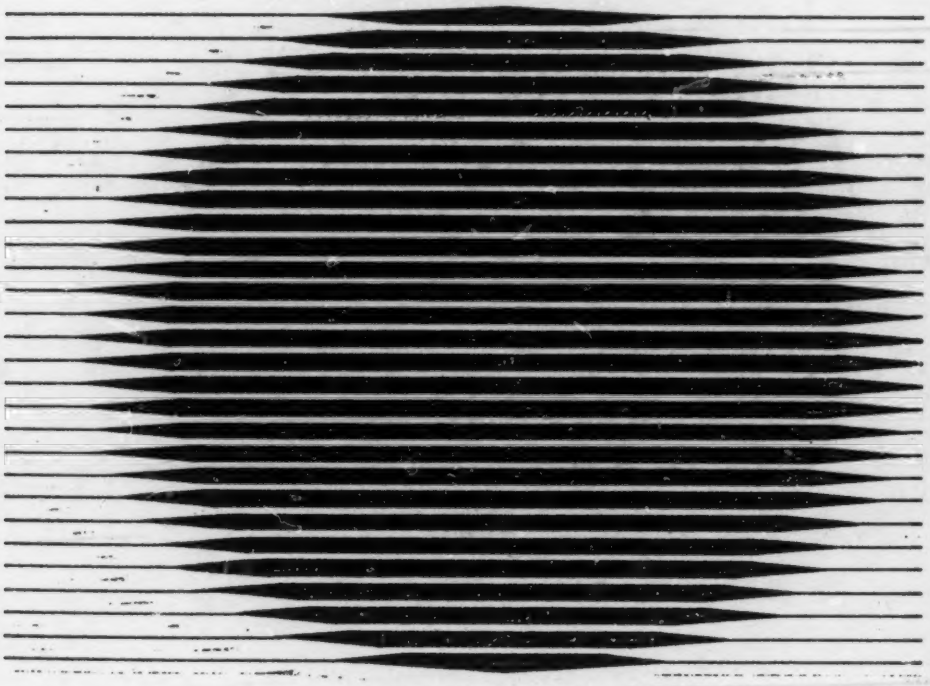
|N|C|R|P|

National Council on Radiation Protection and Measurements

22

SOURCES AND EFFECTS OF IONIZING RADIATION

United Nations Scientific Committee on the Effects of Atomic Radiation
1977 report to the General Assembly, with annexes



UNITED NATIONS

The Effects on Populations of Exposure to Low Levels of Ionizing Radiation: 1980

SOURCES OF HUMAN EXPOSURE INFORMATION

Japanese Survivors of A-Bombs

Marshall Islanders Exposed to Fallout

Pelvic Radiotherapy

Spinal Radiotherapy (Ankylosing Spondilitis)

Neck and Thyroid Radiotherapy

Scalp Irradiation (tinea capitis)

Breast Radiotherapy

Multiple Fluoroscopies

Uranium Miners

Radium-226 Ingestion

Radium-224 Treatment

The CHAIRMAN. Thank you, Dr. Sinclair.
Dr. Bond?

STATEMENT OF DR. VICTOR P. BOND, ASSOCIATE DIRECTOR, BROOKHAVEN AND CHAIRMAN, SCIENTIFIC COMMITTEE 91, NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENT

Dr. BOND. Thank you, Senator Hatch.

It is my privilege to appear again before this committee at the request of the NCRP to testify relative to the bill before you. I thank you, Senator Hatch, for your very generous opening remarks.

My name is Victor P. Bond. I am an associate laboratory director for biomedical and environmental sciences at the Brookhaven National Laboratory in New York. A statement of my qualifications is attached to my testimony.

My appearance here is at the request of the NCRP. Although the intent of my remarks has been discussed with some of the officers of the NCRP, this statement was prepared by me. Thus it represents my personal opinion and not necessarily policy of the NCRP or any other agency or group.

Before proceeding further, may I say that a group of us in the NCRP have decided to replace the term "attributable risk" with the term "probability of causation." The reason for this is to differentiate more adequately between the prospective situation in which an individual receives a dose of radiation and we are interested in the risk of his contracting or coming down with a cancer, and the situation before us here in which we are interested only in the individual who has developed a cancer. It is then only the "probability of a causation" with respect to a specific radiation exposure that is in question.

The CHAIRMAN. The two terms are interchangeable?

Dr. BOND. Yes, right.

The bill before us today is a modification of that discussed during the previous hearings. A principal difference is that the probability of causation approach has been adopted in the present bill as a scientifically defensible means of selecting those most likely to have been injured and therefore most likely to deserve compensation.

The method is described in the literature and was introduced in my testimony during the previous hearings. I think it is important to say that although I have used the approach for years, and have published on it years ago, it is certainly not my invention. The approach is well-known to epidemiologists and well-established in the epidemiological literature.

I wish to compliment you, Senator Hatch, and your associates, and indicate how pleased I and a number of my colleagues are with your willingness to bring scientific considerations to bear directly in attempting to find an equitable solution to the difficult problems addressed in the bill.

I shall describe the approach briefly, and in doing so I shall duplicate to a degree some of your opening remarks, which I thought were right to the point. In so doing, I will also be describing in

principle what committee 71 of the NCRP is doing with respect to this overall approach.

This approach does not address the question of the risk of cancer associated with exposure to radiation. Rather, it concerns only those individuals who have actually developed a type of cancer that is relatable to radiation exposure and the possible causal relationship of that cancer to a specific previous radiation exposure.

It provides an approach to quantification of the strength of the relationship between the specific cancer in question and the specific previous exposure. The answer is provided in terms of a percentum which can be interpreted as the probability that a causal relationship exists between the specific radiation exposure and the development of that cancer.

It is then a policy decision whether the probability is sufficiently large to warrant compensation for the illness. I am in accord with the overall intent of the present bill and with the general approach used to select those individuals with certain types of cancer who have the highest probability of deserving compensation.

My only reservation involves the precedent-setting potential of some provisions of the bill, and in particular with respect to the proposed 10-percent probability level which defines eligibility for compensation. The reasons for this concern are developed as follows.

There is little or no disagreement with the fact that a large population was exposed to fallout radiation and that some relatively small number of individuals should have developed or may yet develop a cancer as a result of that radiation exposure.

It is because of this relatively small group of deserving individuals that serious consideration of compensation is in order. Unfortunately, there is no way at the present of identifying those few individuals.

The probability of causation approach provides a statistical method of ranking those exposed individuals who have a cancer of the type relatable to radiation exposure on the basis of the probability of their being a member of that deserving group.

In order to provide assurance that a reasonable fraction of the deserving group would actually be compensated, it would be necessary to compensate a total number of individuals larger than that deserving group. Non-technical issues of a societal, economic, and moral or political character may enter into the decision on the degree to which compensation is to be expanded beyond the number estimated to be in the deserving group.

One obvious method of increasing the number to be compensated is to permit standards of acceptability for the input information needed to estimate the probability of causation in these special circumstances that are more lenient than might be considered appropriate in other less complicated situations.

There are three ways in which this method could be implemented: one, by permitting individual doses to be used that are in excess of the most likely estimated value, on the grounds that the higher doses cannot be excluded with a high degree of confidence; two, by using values for expected excess incidence of cancer per rad, or risk coefficients, that are markedly conservative—that is to say excessively high—or, third, by setting a relatively low value for the per-

centum of attributable risk that must be met or exceeded in order to qualify for the compensation.

The items of dose and risk coefficients present technical issues. Of these items, dose, in my opinion, provides the better vehicle because of limitations inherent in the data.

As for the risk coefficients, a large body of scientific information exists which supports the risk coefficients used. In fact, good agreement on at least "upper limit" values for risk coefficients is seen in the evaluations of national and international scientific committees constituted to evaluate radiation risks.

Thus leniency might better be achieved in my opinion in the dose than in the risk coefficients. The cutoff percentum level involves nontechnical considerations in an area in which I can claim no special knowledge or competence. Nonetheless, I would like to express a personal opinion.

The 10 percent is appreciably below the 50 or more percent probability level which I think is commonly taken to be the meaning of the legal phrase "more probable than not." I understand that the more probable than not rule is usually considered to represent a minimal standard against which to judge the truth of an alleged causal relationship.

However, the use of the low percentage assigned is unnecessary in my view because one can relax the standards of acceptability as I indicated before. Also, the 10-percent level may raise overall policy issues.

For instance, in a recent note in the Yale Law Journal, the author discusses a probabilistic approach similar to that discussed here. He notes that:

> A threshold lower than the more probable than not, or 50 percent probability level could result in a bandwagon effect: once a particular defendant has been found to be vulnerable, he could find himself sued by many plaintiffs able to demonstrate only a small exposure and whose cancers therefore were not caused by the defendant.

For the above reasons I am concerned about the precedential impact of this bill to the application of the causation approach in other better defined situations. I would therefore urge the committee to recognize fully the truly groundbreaking nature of this bill as written with respect to the application of this approach and to weigh carefully the likelihood that this legislative action to deal with this specific, unique, and complex problem before us now may set precedents unsuited to a much broader range of issues to which the approach is applicable.

Finally, may I say again that many applaud the effort made in this bill to employ scientific approaches to provide an equitable solution to a difficult problem and voice my support for both the intent of and the overall approaches used in the bill.

[The prepared statement of Dr. Bond follows:]

Testimony[1]

The Atomic Bomb Fallout Compensation Act of 1982

V. P. Bond

---

1 Joint Hearings of the Senate Committee on Labor and Human Resources and the Committee on the Judiciary, Subcommittee on Agency Administration, 12 March 1982.

It is my privilege to appear again before this Committee at the request of the National Council on Radiation Protection and Measurements (NCRP) to testify relative to the Atomic Bomb Fallout Compensation Act of 1982 (termed "the bill" below). My name is Victor P. Bond, and I am an Associate Laboratory Director for Biomedical and Environmental Sciences, Brookhaven National Laboratory, Upton, New York. A statement of my qualifications is attached. The National Council on Radiation Protection and Measurements is a private corporation, the charter and functions of which are described elsewhere in this session by Dr. W.S. Sinclair, President of that organization.

Although the intent of my remarks has been discussed with some of the officers of the NCRP, this statement was presented by the author. Thus, it represents my personal opinion and not necessarily the policy of the NCRP.

The bill before us today is a modification of that discussed during the pervious hearings conducted on 27 October, 1981. A prinicpal difference is that the "probability of causation" approach, also termed earlier the "attributable risk" or "causative odds" approach, has been adopted in the present bill as a scientifically-defensible approach for selecting those most likely to have been injured and therefore most likely to deserve compensation. The method is described in the literature (1-4), and was introduced in my testimony during the previous hearings. I wish to compliment Senator Hatch and his associates, and indicate how pleased I and a number of my colleagues are with his willingness to bring scientific considerations to bear directly in attempting to find an equitable solution to the difficult problems addressed in the bill.

97-779 O—82——3

Because a description of the probability of causation approach is available in the record of the previous hearings, I shall provide only a brief summary at this time. This approach does not address the risk that an individual exposed to radiation will develop a cancer. Rather, it concerns only those individuals who have developed a type of cancer that is relatable to radiation exposure, and the possible causal relationship of a specific previous radiation exposure to that cancer. It provides an approach to quantification of the strength of the relationship, if any between the specific cancer in question and the specific pervious exposure. The answer is provided in terms of a percentum, that can be interpreted as the probability that a causal relationship exists between the specific radiation exposure and the development of that cancer. It is then a policy question to determine whether that probability is sufficiently large to warrant compensation for the illness.

I am in accord with the overall intent of the present bill and with the general approach used to select those individuals with certain types of cancer who have the highest probability of deserving compensation. My only reservation involves the precential potential of some provisions of the bill, and in particular with respect to the proposed 10% probability level which defines eligibility for compensation. The reasons for this concern are developed as follows:

There is little or no disagreement with the fact that a large population was exposed to fallout radiation and that some relatively small number of individuals should have and may yet develop a cancer as a result of that radiation exposure. It is because of this relatively small group of deserving individuals that serious consideration of compensation is in order.

Unfortunately, there is no way at present of identifying those few individuals. The probability of causation approach provides a statistical method of ranking those exposed individuals who have a cancer of a type relatable to radiation exposure, on the basis of the probability of their being a member of that deserving group. In order to provide assurance that a reasonable fraction of the deserving group would actually be compensated, it would be necessary to compensate a total number of individuals larger than the deserving group. Non-technical issues of a societal, economic, moral or political character may enter into the decision on the degree to which compensation is to be expanded beyond the number estimated to be in the deserving group.

One obvious method of increasing the number to be compensated is to permit standards of acceptability for the input information needed to estimate the probability of causation for these special circumstances that are more lenient than might be considered appropriate in other less complicated situations. There are three ways in which this input information could be varied: 1) By permitting individual doses to be used that are in excess of the most likely estimated value, on the grounds that the higher dose cannot be excluded with a large degree of confidence, 2) By using values for expected excess incidence of cancer per rad, or risk coefficients, that are markedly conservative (i.e., perhaps excessively high), or 3) By setting a relatively low value for the percentum attributable risk that must be met or exceeded in order to qualify for compensation.

Items 1 and 2 above present technical issues. Of these items, 1, in my opinion, provides the better vehicle because of limitations inherent in

the data. For item 2, a large body of scientific information exists which supports the risk coefficients used. In fact, good agreement on risk coefficients is seen in the evaluations of national and international scientific committees constituted to evaluate radiation risks, (5-8). Thus, leniency might be better achieved in item 1 than in item 2. Item 3 involves non-technical policy considerations in an area in which I can claim no special knowledge or competence. Nonetheless, I should like to express a personal opinion. The 10 percentum, in my view, is appreciably below the value of just over 50 pecent probable, which I believe is commonly taken to be the meaning of the legal phrase "more probable than not". I understand that the 50 percent value is considered to represent a minimal standard of "proof" on an alleged causal relationship. Moreover, the use of the low percentage assigned is unnecessary in view of the ability to relax standards for input data as described above. Also, the 10% level may raise overall policy issues. For instance, in a note in the Yale Law Journal, the author discusses a probabalistic approach similar to that discussed here and notes that "a lower (than the "more probable than not", or 50% greater) threshold) could result in a bandwagon effect: once a particular defendent has been found to be vulnerable, he could find himself sued by many plaintiffs able to demonstrate only a small exposure and whose cancers, therefore, were not caused by the defendent" (9).

For the above reasons I am concerned about the precedential impact of this bill to the application of the approach in other, better defined conditions. I would urge the Committee to recognize fully the truly ground-breaking nature of this bill with respect to the application of the probability of causation approach, and to weigh carefully the likelihood that this legislative action

to deal with this unique and complex problem may set precedents unsuited to a much broader range of issues to which the approach is applicable.

Finally, may I say again that many applaud the effort made in this bill to employ technical approaches to provide an equitable solution to a difficult problem, and voice my support for both the intent of and overall approaches used in the bill.

References

1. Bond, V.P. The Medical Effects of Radiation. National Association of Compensation Claimants Attorneys (NACCA), 13th Annual Convention, Miami Beach, 1959. W.H. Anderson Company, Cincinnati.

2. Oftedal, P., Knut, M. and Torlief, H. On the Probability of Radiation Being the Cause of Leukemia. Br. J. Radiol. 41:711-712 (1968)

3. Bond, V.P. The Cancer Risk Attributable to Radiation Exposure: Some Practical Problems. Health Physics 40:111-113 (1981).

4. Report of the Interagency Task Force on Compensation for Radiation-Related Illnesses. Hearings 10 June, 1980. Joint Hearings, Joint Committee on Health and Scientific Research, Committee on Labor and Human Resources, and the Committee on the Judiciary, on Senate Bill 1865, page 50.

5. The Effects on Populations of Exposure to Low Levels of Ionizing Radiation. The "BEIR" Committee Report. National Academy of Sciences/National Research Council, Washington, D.C., (1972).

6. Sources and Effects of Ionizing Radiation. United Nations Scientific Committee on the Effects of Atomic Radiation, 1977. Report to the General Assembly. United Nations, N.Y., (1977).

7. Recommendations of the International Commission on Radiation Protection. ICRP Publication 26, Annals of the ICRP, Vol. 1, No. 3, 1977, Pergamon Press, New York.

8. The Effects on Populations of Exposure to Low Levels of Ionizing Radiation. The "BEIR III" Report. National Academy of Sciences/ National Research Council, Washington, D.C., 1980.

9. "Tort Actions for Cancer: Deterrence, Compensations, and Environmental Carcinogenesis". 90 Yale Law Journal, 840 at 862, footnotes 77 and 89.

BIOGRAPHICAL SKETCH

March, 1974
Item 1.

Victor P. Bond

Born: Santa Clara, California, 30 November 1919

Education: University of California, Berkeley A.B., 1943
University of California, San Francisco, M.D., 1945
University of California, Berkeley, Ph.D., in Medical Phys., 1952
Long Island University, New York, Honorary D.Sc., 1965

1. Positions:

Head, Experimental Pathology Branch,
U. S. Naval Radiological Defense Laboratory,
San Francisco, California, 1948-1954

Scientist, Medical Research Center,
Brookhaven National Laboratory,
Upton, New York 1955-1957

Head, Division of Microbiology,
Medical Research Center
Brookhaven National Laboratory, 1957-1962

Chairman, Medical Department
Brookhaven National Laboratory
Upton, New York 1962-April 1967

Associate Director, Brookhaven National Laboratory
(For Biology, Chemistry, Medicine, Health Physics
and Safety) Upton, New York April 1967-present

Professor of Medicine, Health Sciences Center
State University of New York at Stony Brook
1968-present

Adjunct Professor of Radiology
Columbia University, 1969-present

2. Fields of Interest:

Medicine, hematology, radiation biology,
nuclear medicine

3. Other Activities and Information:

Participant and project officer in biological
work involving field testing; deputy director
of the medical team that cared for the
Marshallese following exposure to fallout
radiation

Former member of the National Advisory Committee
on Radiation; Subcommittee on Hematology of
the NAS-NRC Committee to Investigate the Effects
of Atomic Radiation; Subcommittee on Radiological
Dosimetry, ICRU; Ad Hoc Committee on RBE, of the
ICRP and ICRU; Armed Forces Panel on Radiological
Instruments; Scientific Advisory Board, USAF;
Chairman, Radiation Study Section, National
Institutes of Health; Director, Commission on
Radiation Infection, AFEB.

V. P. Bond, M.D., Ph.D.

4. Present Activities:

Chairman, ICRU Committee 10e, on Biological Dosimetry

Member, Life Sciences Committee, NASA

Member, NCRP Committee 40, on Biological Effects of Radiation

Members, Committee on Nuclear Science, NAS

Member, Committee on Radiobiology, American College of Radiology

Member, Standing Committee for Radiation Bio-Aspects of the SST, Federal Aviation Administration

Consultant, Public Health Service, Department of Health, Education and Welfare

Consultant, Defense Atomic Support Agency

Member, National Commission on Radiation Protection and Measurements

Councillor, Radiation Effects Research Foundation, (formerly ABCC)

5. Former Activities:

Chairman, Subcommitttee M-4 of the National Council on Radiation Protection, on Relative Biological Effectiveness

Chairman, Radiation Bio-Effects Advisory Committee for the Division of Radiological Health (Department of Health, Education and Welfare)

Member, Commission on Epidemiological Survey (Armed Forces Epidemiological Board, Department of Defense)

Member, Radioactive Pharmaceuticals Advisory Committee, Federal Drug Administration

Member, Advisory Committee of the Federal Radiation Council, (Now part of the EPA) National Academy of Sciences

Member, Biological Effects of Ionizing Radiation (BEIR) Committee, NAS/NRC

Chairman, Subcommittee on Radiobiology of the Committee on Nuclear Science (National Academy of Science)

V. P. Bond, M.D., Ph.D.

5. Former Activities, continued.	Member, Aeromedical Task Force, National Aeronautics and Space Administration
	Member, Board of Directors, National Commission on Radiation Protection and Measurements.
	1972-73, Vice Pres., Radiation Research Society
	1973-74, Pres., Radiation Research Society
	1971-74, Pres., 5th International Congress of Radiation Research, held in Seattle, Washington, July 1974.
6. Professional Organizations:	American Physiological Society
	New York Academy of Sciences
	Radiation Research Society
	Sigma Xi
	American Association for the Advancement of Science
	Society of Experimental Biology & Medicine
	Society of Nuclear Medicine
	International Society of Hematology
7. Publications:	Over 280 scientific papers largely on the effects of radiation, hematology and cell kinetics
8. Military:	Military Officer, U. S. Navy, 1945-54
	Presently, Rear Admiral, MC, USNR-R

Item 2.

Publications, V. P. Bond

1) Evaluation of Potential Hazards from Tritiated Water, V. P. Bond. Proceedings of IAEA Symps. "Environmental Aspects of Nuclear Power Stations", New York, New York, August 10-14, 1970, IAEA SM 146/13, BNL #15033.

2) Biological Effects of very High Energy Nuclei of High Z (IAEA SM 145/22). Proceed. of a symp., Lucas Heights, Australia, March 8-12, 1971, BNL #15172, V. P. Bond.

3) Inactivation of Mammalian cells after Disinitegrations of ^{3}H or ^{125}I in Cell DNA at -196°C. H. John Burki, R. Roots, L. E. Feinendegen and V. P. Bond. International Journal Radiation Biology 1973, Vol. 24, No. 4, 363-375.

4) The Impact of Nuclear Power on the Public: The American Experience. V. P. Bond - Lecture at the Kernforschungsanlage, Julich, West Germany, January 1973, BNL #17897.

5) Visual Sensations Induced by Cerenkov Radiation, P. J. McNulty, V. P. Pease and V. P. Bond, Science, Vol. 189, 453-454, 8 August 1975.

RÉSUMÉ

VICTOR P. BOND

Title: Member of the Council

Role in Project: Member of the Council, Chairman of Scientific Committee 40 on Biological Aspects of Radiation Protection Criteria

Personal Information

Birthdate: November 30, 1919 Place of Birth: Santa Clara, California, U.S.A.

Nationality: U.S. Sex: Male

Education:

University of California, Berkeley, A.B., 1943
University of California, San Francisco, M.D., 1945
University of California, Berkeley, Ph.D., 1952

BEST COPY AVAILABLE

Experience

Associate Director, Brookhaven National Laboratory	1967 - present
Chairman, Medical Department, Brookhaven National Laboratory	1962 - 1967
Head, Division of Microbiology, Medical Research Center, Brookhaven National Laboratory	1955 - 1957
Scientist, Medical Research Center, Brookhaven National Laboratory	1955 - 1957
Head, Experimental Pathology Branch, U.S. Naval Radiation Defense Laboratory, San Francisco	1948 - 1954

Publications

(Selected from a list of over 280 publications)

V.P. Bond, "Evaluation of potential hazards from tritiated water," Proceedings of IAEA Symp. Environmental Aspects of Nuclear Power Stations, New York, New York, August 1-14, 1970, IAEA SM 146/13, BNL #15033.

V.P. Bond, "Biological effects of very high energy nuclei of high Z," (IAEA SM 145/22) Proceedings of a Symposium, Lucas Heights, Australia, March 8-12, 1971, BNL #14172.

E. John Burki, R. Root, L.E. Feinendegen, and V.P. Bond, "Inactivation of mammalian cells after disintegrations of ^{3}H or ^{125}I in cell DNA at -196°C," International Journal Radiation Biology 1973, Vol. 24, No. 4, 363-375.

V.P. Bond, C.B. Meinhold, and H.H. Rossi, "Low-dose RBE and Q for x-ray compared to gamma ray radiations," Health Physics 34, 433 (1978).

BEST COPY AVAILABLE

The CHAIRMAN. Thank you so much, Dr. Bond.
Mr. Jablon?

STATEMENT OF SEYMOUR JABLON, NATIONAL ACADEMY OF SCIENCES AND MEMBER, SCIENTIFIC COMMITTEE 71, NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENT

Mr. JABLON. Thank you, Senator Hatch.

I am very grateful to have this opportunity to appear before you.

I am employed by the National Academy of Sciences, where I am the staff officer responsible for the Academy's activities with respect to the followup studies of the atomic bomb survivors in Hiroshima and Nagasaki. I am a statistician by training and for the last 25 years I have been especially concerned with the epidemiology of radiation-induced adverse effects upon health, especially cancer. I spent 6 years in Hiroshima engaged in the studies of the Japanese survivors.

I am a member of the NCRP about which Dr. Sinclair has told you. However, I am testifying today as an individual and not as a representative of the NCRP nor as a staff member of the National Academy of Sciences.

I am also a member of the Dose Assessment Advisory Group, an external committee appointed by the Secretary of the Department of Energy to monitor the program of assessing radiation doses to the off-site populations from fallout which resulted from tests at the Nevada test site. So I am familiar with the work on this problem, both the status and the quality.

We are in a much better position to achieve equitable solutions with respect to radiation injury than if we were concerned with toxic substances which are believed to cause human cancer. That is because we do have quantitative estimates of radiation risks for cancer induction.

We know pretty well which cancer sites are most sensitive and we have numerical estimates of risk for them. We know about minimum latent periods which must elapse between radiation exposure and the onset of cancer which it induces, not more than a year or two for leukemia but 10 years or more for the so-called solid tumors such as breast cancer or lung cancer.

We know a fair amount about the variation of sensitivity to cancer induction in relation to age and sex. The main problem is that those cancers which are induced by radiation are indistinguishable clinically from those that are not.

It turns out that even in a population which has been irradiated—say 10 rads of X-ray—the number of cancers induced is but a small fraction of the number of cancers which arise normally.

For example, about 18 percent of all deaths in the population of the United States are caused by cancer. If we add to the fatal cancers those which do not cause death—the breast cancers which are cured, the many skin cancers and thyroid cancers which are rarely fatal—it is clear that about 35 percent of a population will at some time have cancer.

Some small proportion of these cancers have, presumably, been induced by natural background radiation. In a population of 100,000 persons, that is, some 35,000 cancers will arise sooner or

later in the absence of radiation. We may refer to this as the baseline frequency.

Now according to the 1977 report of the United Nations Scientific Committee on the Effects of Atomic Radiation, the UNSCEAR report, if every member of that population had received 10 rads of X-ray, perhaps some 200 extra fatal cancers would be induced, or 300 to 400 in total taking into account the nonfatal or the curable cases. If we were to compensate every person among the 100,000 who developed cancer, 35,000, we would be compensating around 100 persons for every 1 who was truly deserving.

The situation is, however, not entirely hopeless. The radiation sensitivity of different tissues varies considerably. Age variation in sensitivity bears little relation to the baseline rates. If we specify the kind of cancer, the age and sex of the individual, the radiation dose, and the number of years that elapsed between receipt of the radiation dose and the onset of the cancer, we can improve in a remarkable way on the one in a hundred probability that was mentioned above.

It is fortunate that the National Cancer Institute has recently published cancer incidence data covering the period 1973 to 1977. It is called the SEER data. These rates were derived from 10 population-based registries with a coverage of about 20 million persons.

The Committee on the Biological Effects of Ionizing Radiation of the National Academy of Sciences, the BEIR Committee, in 1980 published its most recent report which provides explicit estimates of the cancer-inducing effects of radiation per unit of dose to the organ.

These estimates are specific to certain kinds of cancer, sex, age at exposure, and time from exposure to onset of disease. Similar estimates are available in the UNSCEAR report.

To show how great is the leverage that can be obtained by using these resources, if we consider all cancer, following 10 rads of whole body X-ray, only about 1 cancer out of every 100 that occurs will have been induced by the radiation. That is, the probability of causation is about 1 percent.

Suppose a young man, aged 19, develops acute leukemia. Suppose further that he had received a whole body dose of 10 rads 12 years earlier at the age of 7. Suppose the average dose to the bone marrow was 5 rads because of attenuation by passage through overlying tissues.

The annual baseline incidence rate in males aged 19 was 2.9. The annual excess rates per rad for males is about 4 per million or 0.4 per 100,000. For 5 rads, we can estimate that there would be two cases induced by the radiation. His total risk would then be 4.9, of which the radiation risk accounts for 41 percent.

Similarly, for a female who develops thyroid cancer 20 years after receiving a dose to the thyroid of 50 rads at age 27, the probability of causation would be 75 percent.

For a male who received 10 rads to the tissue of the lung at age 35 and developed lung cancer 35 years later at age 70, the probability of causation would be only 1 percent.

I have given several other examples in my written testimony.

What do we need to know to be able to calculate the probability of causation in any particular instance? The kind of cancer, of

course, the age and sex of the patient, and the interval of time that elapsed between the radiation exposure and the onset of the disease. These can all in principle be determined accurately.

In addition, we need to know first the baseline incidence for the particular cancer in a person of the patient's age and sex. Two, we need to know the radiation dose received by the particular organ which gave rise to the cancer, and, three, the specific cancer induction rate per rad delivered to that organ in terms of age, sex, and period of latency.

The first of these, the baseline incidence data, are available from the SEER report. I believe they are substantially accurate.

The second requirement is to know the organ dose of radiation to the person. In some situations this can be well known, for example, workers in nuclear industries who are monitored by the use of film badges or other personal dosimeters.

For the residents of the counties near to the Nevada test site at the time of atmospheric testing of nuclear weapons, the situation is not so clear. From my knowledge of the dose assessment program, I am convinced that the groups from the national laboratories and universities that are working on the problem are both capable and dedicated. I believe they will be able to derive reasonably good average doses to the residents of particular places at specified times, both from external radiation and from ingested radioactive materials.

It is clear, however, that not every resident of St. George, say, will have received the same average dose. Such factors as the proportion of time spent indoors or outdoors, the amount and source of milk which was drunk, and so on will influence the dose.

What is needed is not only the average dose in each community but a measure of the amount of variability among individuals. Such data are already available for doses to the thyroid gland in terms of age, but, in general, uncertainty estimates are still being calculated.

From the preliminary work that I have seen, I think it likely that the doses to particular individuals may well vary by a factor or 2, or perhaps even more, from the average at a particular place and time. My own opinion is that a claimant is entitled to the benefit of every reasonable doubt, so I would advocate using not the average dose but a maximum credible dose which, as I have said, would be perhaps twice or three times the average dose.

Finally, there is the problem of the accuracy of the specific cancer induction rates per rad which have been published by the National Academy of Sciences' BEIR Committee. There is much uncertainty concerning the risk coefficients which are applicable to low doses. By low, I mean here doses of the order of 10 to 20 rads at the most.

It is a fact that almost all of the risk estimates are based upon data for populations, whether treated by medical X-ray or exposed to atomic bombs, for which doses have been quite large, 50, 100, 200 rads or more. There is much evidence from radiobiology that at quite low doses, say a tenth of a rad, the effects may be only one-half to one-tenth of the effects that are measured at large doses. Unfortunately, effects at very low doses are impossible to measure.

The radiobiological community is convinced from a very large body of experimental data that the linear extrapolation is conservative, that is the actual effect might be only one-half as large as that which is assumed, but is most unlikely to be larger.

It seems reasonable then to treat the two soft elements of the calculation in such a way as to favor the interests of the claimant: by utilizing estimates of dose which are not best but maximum credible and by using risk estimates which on radiobiological theory and experiment are probably too large.

This being done, the probability of causation can be calculated for any claimant and we can be comfortable in the knowledge that to the extent that we are wrong it is by overestimating that risk.

In summary, by drawing upon the extensive knowledge that we have concerning the cancer-inducing effects of ionizing radiation and the extensive dose reassessment program being sponsored by the Department of Energy, it is possible to estimate for each claimant the probability that the illness was, in fact, caused by radiation received from fallout from the atmospheric tests.

It is moreover possible to do this in a way that will be fair to the claimants in that the probability of causation will almost surely not be underestimated. Further, a valuable precedent will be set for the use of the best scientific information available in respect to claims for radiation-induced injury in other contexts.

By making use of the best available scientific evidence it is possible to compensate those who deserve compensation, or those who are most likely to deserve compensation, without at the same time opening wide the doors to the U.S. Treasury on behalf of a third of the population who will, unfortunately, suffer from some form of cancer at some time in their lives.

Thank you very much. Of course I will try to answer any questions you may have.

[The prepared statement of Mr. Jablon follows:]

TESTIMONY BEFORE THE SENATE COMMITTEE ON LABOR
AND HUMAN RESOURCES CONCERNING
THE RADIATION EXPOSURE COMPENSATION ACT OF 1981

March 12, 1982

Seymour Jablon
National Academy of Sciences — National Research Council

I am very glad to have this opportunity to appear before you in connection with the proposed legislation which is concerned with compensation for injury resulting from radiation exposure. My name is Seymour Jablon and I am employed by the National Academy of Sciences-National Research Council, where I am the staff officer responsible for the Academy's activities with respect to the follow-up studies of the atomic bomb survivors in Hiroshima and Nagasaki. I am a statistician by training and for the last 25 years or more I have been especially concerned with the epidemiology of radiation-induced adverse effects on health, especially cancer. I have spent six years in Hiroshima engaged in the studies of the Japanese survivors. I am a member of the NCRP, about which Dr. Sinclair has told you. However, I am testifying today as an individual, and not as a representative of the NCRP nor as a staff member of the National Academy of Sciences. The Academy, to my knowledge, has taken no position on the proposed legislation. I am also a member of the Dose Assessment Advisory Group, an external committee appointed by the Secretary of the Department of Energy to monitor the program of assessing radiation doses to the off-site populations from fall-out which resulted from tests at the Nevada Test Site. So I am familiar with the work on this problem, both its status, and its quality.

Although it is impossible to work perfect justice with respect to the issue which concerns you, we are, in fact, in a much better position to achieve equitable solutions here than if we were concerned with any of a large number of toxic substances, which are believed to cause human cancer. That is because, although our knowledge is to some extent imperfect and inexact, we do have quantitative estimates of radiation risks for cancer induction. We know pretty well which cancer sites are most sensitive, and we have numerical estimates of risk for them. We know about the minimum latent periods which must elapse between the radiation exposure and the onset of the cancer which it induces — not more than a year or two for leukemia but 10 years or more for the so-called solid tumors such as breast cancer or lung cancer. We know a fair amount about the variation of sensitivity to cancer induction in relation to age and sex — thus, girls between 10 and 19 years of age are more sensitive to the induction of breast cancer than are older women; and females, in general, are more likely than males to have cancer of the thyroid gland following radiation.

The main problem is that, although there are a few kinds of cancer that are not induced by radiation — chronic lymphocytic leukemia is one of them — those cancers which <u>are</u> induced by radiation are indistinguishable clinically from those that are not. It turns out that, even in a population which has been irradiated — say 10 rads of X-ray — the number of cancers induced is but a small fraction of the number of cancers which arise "normally." For example, about 18 percent of all deaths in the population of the United States are caused by cancer. If we add to the fatal cancers those which do not cause death — the breast cancers which are cured, for example, and the many skin cancers and thyroid cancers which are rarely fatal — it is clear that about 35 percent of a population will, at some time, have a cancer. Some small

proportion of these cancers have, presumably, been induced by natural background radiation. In a population of 100,000 persons, that is, some 35,000 cancers will arise, sooner or later, in the absence of radiation. We may refer to this as the "baseline" frequency. Now, according to the 1977 report of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), if every member of that population had received 10 rads of X-rays, perhaps some 200 extra fatal cancers would be induced, or 300-400 in total, taking account of non-fatal and other curable cases. If we were to compensate every person among the 100,000 who developed cancer — 35,000 — we would be compensating around 100 persons for every one who was truly deserving.

The situation is, however, not entirely hopeless. The radiation sensitivity of different tissues varies considerably, and the age variation in sensitivity bears little relation to the baseline rates. If we specify the kind of cancer, the age and sex of the individual, the radiation dose and the number of years that elapsed between receipt of the radiation dose and the onset of the cancer, we can improve in a remarkable way on the one in a hundred probability that was mentioned above. It is fortunate that the National Cancer Institute has recently published cancer incidence data covering the period 1973-1977. These rates were derived from 10 population-based registries with a coverage of about 20 million persons, well-distributed geographically, and including representatives of all principal ethnic groups. This is the so-called SEER report of the Surveillance, Epidemiology and End Results Program. The Committee on the Biological Effects of Ionizing Radiation of the National Academy of Sciences — the BEIR Committee — in 1980 published its most recent report which provides explicit estimates of the cancer-inducing

97-779 O—82——4

effects of radiation per unit of dose to the organ. These estimates are specific to certain kinds of cancer, sex, age at exposure and time from exposure to onset of disease. Similar estimates are available in the UNSCEAR 1977 report.

A few examples will illustrate how great is the leverage that can be obtained by using these resources. If we consider all cancer, following 10 rads of whole body X-ray, only about one cancer out of every 100 that occurs will have been induced by the radiation. That is, the Probability of Causation — probability that the cancer was caused by the radiation — is about one percent. Suppose a young man, aged 19, develops acute leukemia. Suppose further that he had received a whole-body dose of 10 rads 12 years earlier, at the age of seven. Suppose the average dose to the bone marrow was five rads, because of attenuation of the radiation by passage through the overlying tissues. From SEER, we see that the annual baseline incidence rate in males aged 19 was 2.9 per 100,000 in 1973-77; from the BEIR report we learn that the annual excess cases per rad for males exposed at age seven is about four per million, or 0.4 per 100,000. For five rads to the marrow, then, the excess would be five times 0.4, or two cases per 100,000. His <u>total</u> risk would be the sum of the baseline rate of 2.9 plus the excess risk from radiation of 2.0, for a total risk of 4.9, of which the radiation risk accounts for 41 percent, since 2.0/4.9 = .41. Similarly, for a female who developes thyroid cancer 20 years after receiving a dose to the thyroid of 50 rads at age 27, the Probability of Causation (PC) would be 75 percent. For a male who received 10 rads to the tissue of the lung at age 35, and developed lung cancer 35 years later at age 70, the PC would be only 1.0 percent. It is so low because the baseline rate of lung cancer in 70-year-old males is very large. For a female, the PC would have been 5 percent. However,

had the female developed the cancer at age 47, only 12 years after exposure, the PC would have been 11 percent, because the baseline rate for lung cancer in 47-year-old females is lower than at age 70, and very much lower than for males at age 70. On the other hand, if a male, exposed at age 30 or more, developed a cancer of the colon 20 or more years after the exposure, he PC would be at most 0.7 percent, depending on his exact age. If he developed chronic lymphocytic leukemia the PC would be zero, since this disease has not shown excess incidence following radiation exposure in any population studied.

The calculations that are required are simple in principle but the results will be no better in quality than are the ingredients that go into it. What do we need to know to be able to calculate the Probability of Causation in any particular instance? The kind of cancer, of course, the age and sex of the patient and the interval of time that elapsed between the radiation exposure and the onset of disease. These can all, in principle, be determined accurately. In addition we need to know:

1. The baseline incidence rate for the particular cancer in a person of the patient's age and sex.
2. The radiation dose received by the particular organ which gave rise to the cancer.
3. The specific cancer induction rate, per rad delivered to that organ, in terms of age, sex, and period of latency.

The first of these — the baseline incidence data — are available from the SEER report and are as accurate as a large population base and dedicated investigation can make them. They will be updated, at intervals of a few years, so that contemporary cancer incidence data of high quality can be counted upon.

The second requirement is to know the organ dose of radiation to the person. In some situations this can be known well - for example, workers in nuclear industries who are monitored by the use of film badges or other personal dosimeters. For the residents of the counties near to the Nevada Test Site at the time of atmospheric testing of nuclear weapons, the situation is not so clear. From my knowledge of the Dose Assessment program, I am convinced that the groups from the National Laboratories and Universities that are working on this problem are both capable and dedicated. I believe that they will be able to derive reasonably good average doses to the residents of particular places at specified times, both from external radiation and from ingested radioactive materials. It is clear, however, that not every resident of St. George, say, will have received the same average dose. Such factors as the proportion of time spent indoors or outdoors, the amount and source of milk which was drunk, will influence the dose. What is needed is not only the average dose in each community, but a measure of the amount of variability among individuals. Such data are already available for doses to the thyroid gland in terms of age, but in general, uncertainty estimates are still being calculated. From the preliminary work that I have seen, I think it likely that the doses to particular individuals may well vary by a factor of two, or perhaps even more, from the average at a particular place and time. My own opinion is that a claimant is entitled to the benefit of every reasonable doubt, so I would advocate using, not the average dose, but a maximum credible dose which, as I have said, would be perhaps twice or three times the average dose.

Finally, there is the problem of the accuracy of the specific cancer induction rates per rad, which have been published by the National Academy of Sciences' BEIR Committee. There is much uncertainty concerning the risk

coefficients which are applicable to low doses. By "low" here I mean doses of the order of 10 to 20 rads at most. It is a fact that almost all of the risk estimates are based upon data for populations, whether treated by medical X-ray or exposed to atomic bombs, for which doses have been quite large - 50, 100, 200 rads or more. There is much evidence from radiobiology that the carcinogenic effect or radiation, per rad, decreases as the dose is reduced. That is, the relationship is probably not linear, and at quite low doses - say a tenth of a rad - the effects may be only one-half to one-tenth of the effects that are measured at large doses. Unfortunately, effects at very low doses are impossible to measure, because the excess cancers are so few compared to the baseline incidence that sample size requirements become impossibly large. We are forced, then, to extrapolate from high dose data to what might happen at low doses, and the radiobiological community is convinced, from a very large body of experimental data, that the linear extrapolation is conservative; that is, the actual effect might well be only one-half as large as that which is assumed, but is most unlikely to be larger.

It seems reasonable, then, to treat the two "soft" elements of the calculation in such a way as to favor the interests of the claimant: By utilizing estimates of dose which are not "best" but are "maximum credible" and by using risk estimates which, on radiobiological theory and experiment, are probably too large. This being done, the Probability of Causation can be calculated for any claimant, and we can be comfortable in the knowledge that, to the extent that we are wrong, it is by overestimating that risk.

In summary, by drawing upon the extensive knowledge that we have concerning the cancer-inducing effects of ionizing radiation, and the extensive dose reassessment program being sponsored by the Department of Energy, it is possible

to estimate, for each claimant, the probability that the illness was in fact caused by radiation received from fallout from the atmospheric tests. It is, moreover, possible to do this in a way that will be fair to the claimants in that the Probability of Causation will almost surely not be underestimated. Further, a valuable precedent will be set for the use of the best scientific information available in respect to claims for radiation-induced injury in other contexts. By making use of the best available scientific evidence it is possible to compensate those who deserve compensation, or those who are most likely to deserve compensation, without, at the same time, opening wide the doors to the U.S. Treasury on behalf of a third of the population who will, unfortunately, suffer from some form of cancer at some time in their lives.

The CHAIRMAN. Thank you so much.

We have appreciated the testimony of all three of you today.

Dr. Bond, I realize if we set the compensable threshold at a 10-percent attributable risk or, as you refer to it, probability of causation we will be using a standard of proof that is considerably less than the courts normally employ.

However, we are also prorating damages to the size of the risk. That also would be a new departure from the courts. In other words, we are limiting damages even though we are expanding the liability by this legislation.

Do you not think that a combination of these two approaches results in a fairly equitable arrangement?

Let me elaborate a bit further. If we award $50,000 to a person with a 10-percent attributable risk, we are paying this money to a person who has a 1 in 10 chance of having developed his cancer from radiation, which means in effect that we would be paying $50,000 to 10 people to be relatively sure that we are getting $50,000 to one person whose cancer was caused by radiation.

Looking at this a bit differently, you could say that we are paying $500,000 per cancer since the radiation caused cancer should be among 10 for which we are awarding $50,000. Now $500,000 per cancer, in the view of most people, would not be an unreasonable amount.

We are in effect dividing one award among 10 people, each of whom is equally likely to have been harmed by the radiation. Do you consider that a reasonable approach?

Dr. BOND. Yes, sir. I do not disagree at all that the sense of your approach is equitable. As I indicated in my testimony, I am now speaking in an area in which I really have no expertise, but we still have the 10 percent in your approach. The "probability of causation" approach would have very wide applicability in other situations in which individuals are exposed, and in which there will not be the same degree of motivation to be lenient, if you will, and in

which the circumstances will be much better defined. Specifically in radiation protection, individuals are badged, good records are kept, and we know the dose will not be in question nearly to the degree it is in the Utah situation.

My concern with the 10 percent—again I am not an expert—is that the fact that it appears in legislation will set a precedent that will be difficult to get around in other circumstances. In other situations one might not wish to use such a low percentage and might wish to come closer to the 50 percent that I believe is usually considered a reasonable or minimal standard for the establishment of cause and effect.

The CHAIRMAN. Thank you.

Dr. Sinclair, I realize the NCRP, being a scientific organization, cannot endorse legislation such as the draft legislation we have come up with here. By necessity it has to include value judgments.

However, am I right in concluding from your testimony that the NCRP does or would endorse the radioepidemiological attributable risk approach employed in the bill as a valid means of focusing in on the persons most likely harmed by the Nevada fallout? Also, would you consider this approach a best means to an end?

Dr. SINCLAIR. Yes, sir. As I stated, the NCRP certainly endorses the radioepidemiological approach. We expect Committee 71, in fact, to produce a report which will address these issues in the general sense and recommend that this approach be used. I think that will be the outcome of the committee's work.

I think that means, automatically, that the general approach can then be specifically adopted to circumstances like those in Utah in which individuals undoubtedly were exposed.

The CHAIRMAN. How long do you think it would take to compile the radioepidemiological tables of attributable risk or probabilities of causation that are required in the draft legislation? Are the data necessary? Are they readily available?

Dr. SINCLAIR. The data are available in a rather general form in the reports I cited. I mentioned uncertainties in my own testimony. The BEIR Committee, for example, gives ranges of numbers for most of its risk estimates. This means that a committee or a group of people rather than an individual would want to deliberate on which of those numbers is the most appropriate to use in formulating the tables that I think are referred to in the bill as being the basis of these things.

The CHAIRMAN. What do you think of that, Mr. Jablon? How long would it take to compile the tables?

Mr. JABLON. As a number of people in this room know, I attempted a first run at that and it took me about a month, but I was in the fortunate position of not having to work with a committee so I could do it the way I wanted to do it.

The CHAIRMAN. Having been chairman of the Labor and Human Resources Committee over the last year, I think I fully understand what you are saying.

There seems to be considerable disagreement within the scientific community concerning the extent of the dangers involved with lower levels of ionizing radiation. This being the case, do you believe it possible to develop a general consensus within the scientific

community concerning a set of radioepidemiological tables of attributable risk?

Let me put it another way. Can the Department of Health and Human Services develop tables that will be considered valid by the scientific community?

Dr. BOND. I believe there is less disagreement in the scientific community than is generally believed. More specifically, a number of groups, national and international, have looked at the same data. After all, there is only one basic body of data. Over the years, and with the same data, they have agreed within remarkably small limits on the upper limit referred to by Mr. Jablon. That is the value closest to that used by Mr. Jablon, and which probably any group reviewing the data might wind up using, for the low LET radiation.

In answer to your question, I do not believe there is that much disagreement about the upper limit values. There is agreement within a relatively narrow range. By the scientific community I mean some very large percentage of individuals familiar with this type of data and familiar with working with it.

I do not mean to say that there are not some—I am sure they have their reasons—who believe that those numbers may underestimate the true value. However, I believe that the vast body of scientists in the national and international community are in reasonable agreement with these upper limit numbers.

The CHAIRMAN. Would you other two gentlemen agree with that?

Dr. SINCLAIR. Dr. Hatch, I agree with that in general. However, the production of those tables is a very complex matter. There is a large collection of numbers involved in them. I think one can only be sure, or one can be better satisfied with the results of such a table, if a number of people were to have been over them in some detail and discussed them. That is what really takes the time. It is the interaction between people and the final judgment that a group would come to as opposed to individuals.

The CHAIRMAN. However, you have no doubt that could be done.

Dr. SINCLAIR. I have no doubt that could be done.

The CHAIRMAN. Mr. Jablon, you were shaking your head yes also?

Mr. JABLON. I would agree.

The CHAIRMAN. I am concerned about the evidence that would be available to people to demonstrate the size of their doses. First, do you think there is reason to question the validity of the data of the Federal Government, the data it has used to estimate doses people received from the Nevada atmospheric nuclear testing programs?

Mr. JABLON. From my knowledge of the current dose assessment program, I have no reason to believe there is any attempt to cover anything up or to do other than the very best job it is possible to do. In fact, if I may say, I have been surprised at the magnitude of some of the dose estimates that they are coming up with.

The CHAIRMAN. You are surprised at the magnitude of some of the dose estimates that have come up?

Mr. JABLON. Particularly doses to the thyroid gland from radioactive iodine.

The CHAIRMAN. I see. Do you think it is possible to assess accurately people's doses 20 or 30 years after their exposure?

Mr. JABLON. No, I do not. That is why I stated in my testimony that I think what we need is the maximum credible dose for individuals. I think that the current effort will be able to take an area and say our best estimate of the average dose in this area was so-and-so much, taking account of the way people distribute, as to whether they are indoors or outdoors, or drink milk or do not drink milk, or where the milk came from and that sort of thing.

Obviously averages do not pertain to individuals. The individuals in the community will have a varying set of doses and the average may not apply to any great number of them. I think it would be possible to determine a dose level such that you are fairly confident that the probability that any individual in the area had a larger dose than that is less than 5 percent, the so-called 95 percent upper limit. That might be, as I said, two or three times the average dose in the population. I feel that it would be reasonable to give any claimant the benefit of this so-called maximum credible dose and upper limit, but that is not a scientific judgment.

The CHAIRMAN. Do either of you have any other comments?

Dr. BOND. I have not worked as closely with the dose figures as has Mr. Jablon, but I am familiar with them. I have been amazed at how well these individuals or groups are able to do in assessing the average dose generally and among smaller groups.

I would like to say that we certainly are not entirely without dosimetry performed at the time. As a matter of fact, some individuals were actually badged. I do not know the extent of this, but we do have checks, if you will, of calculations, against actual measurements. Also, as you know, a very extensive and very careful effort has been made, in an attempt to reconstruct those doses.

The CHAIRMAN. The legislation we are considering today deals only with cancer that was caused by the fallout from the Nevada atmospheric nuclear testing program. I do realize that there is some concern about what kind of precedent this legislation might set for other cases involving alleged damages to radiation exposure. Although these atmospheric tests were a very special series of events and the remedy is especially designed for the people who suffered from those events, and although it is only prudent to enact this law and see how it operates before we presume that it is an influential precedent, still I think we should consider this legislation in even a greater context.

Even if we require broad benefit of the doubt in this legislation and indeed we leave the compensable threshold at 10 percent of attributable risk and require 95 percent confidence interval for dose estimates, even then is it not true that our legislation would not compensate more than a few hundred people and that if the same method here used to assess liability within the nuclear power industry some people who may well have been harmed would receive damages and not so many so as to endanger that industry. Is that correct?

Mr. JABLON. I believe that to be true.

The CHAIRMAN. That is because of the scientific data and evaluation and the way the legislation itself is written.

Mr. JABLON. I think, Senator, I have referred to these tables I have made. Some of them have pretty big numbers for what we

were calling attributable risk at that time or probability of causation and they have scared people.

However, the implication is not that any large number of persons who have radiation exposure whether in Utah or Nevada or in a nuclear powerplant, will actually get a cancer. The worst case from the point of view of attributable risk is thyroid cancer. This is because the thyroid is perhaps the most sensitive organ in the body and because the thyroid tends to concentrate iodine. It concentrates radioactive iodine just as it does others. The sum of the doses to the thyroid from radioactive iodine are very high. Thus the attributable risks come up and probability of causation is high.

Now I want to turn to the risk side. Supposing you have a lot of people and supposing they get doses to their thyroid from radioactive iodine, will a very large number of them develop thyroid cancers? The answer is no.

I did a quick calculation and it turns out for 10 rads one would expect about 80 persons in 100,000 to develop a thyroid cancer. What we are saying with the attributable risk or probability of causation is those 80 cases the cancers very likely were caused by the radiation. We are not saying that a large number of people are going to get cancer.

I think it is terribly important to make that distinction. We do not want to scare everybody with the idea that small amounts or even moderately large amounts of radiation are going to cause cancer in everyone. It is not going to, but in certain situations, if there was an exposure and there was a cancer, there is a pretty good likelihood that the cancer was caused by the radiation.

The CHAIRMAN. Dr. Bond?

Dr. BOND. May I address that question in a little bit different way?

As opposed to the situation in which one calculates average dose and deals with averages across dose, sex, age, and so forth, this approach that we are dealing with is very specific to the individual who has cancer. One cannot average across anything. It is very specific with respect to the individual, the type of cancer, the sex, the age, and other factors.

In order for an individual to have a probability of causation high enough for serious consideration at least two things have to be fulfilled. One is there has to be an appreciable dose. Attributable dose is simply not going to give you a high enough probability. The other thing is the cancer has to be relatively rare.

One is going to be compensating, if you will, or have grounds for compensation only in the relatively small percentage of exposed individuals who have both relatively high dose and a rare type of cancer. That automatically tends to weed out a large number of individuals with cancer.

The CHAIRMAN. Let me turn to the issue of safety standards for radiation exposure. I know that there is some concern that if damages are awarded to anyone who has received a dose that would be allowed by the current safety standards this would force the tightening up of those standards to a degree to where it would be impossible for our nuclear industry and defense programs.

I do not personally believe this to be true. It seems to me that radiation safety standards have had to be especially strict just be-

cause we have not been able to determine which individuals have been harmed by radiation. For other hazards, people are protected by both safety laws and compensation laws, but for radiation the only effective protection has come from the safety laws.

Is it not true that a person can have a very high attributable risk, say 50 percent, if this person has a cancer, and still the risk of anyone getting this same cancer from the same amount of radiation could be very low?

Mr. JABLON. I have a little example if I may. We build bridges in this country. I do not know how many, but I know that a fair number of people were killed by falling off the George Washington Bridge in New York when it was built. Any time we build a large suspension bridge over a wide body of water we can take it as almost certain that somebody is going to be killed.

The proportion of the workers who are killed fortunately is very low and we are willing to take that risk. Nevertheless, if a worker falls off the bridge and is killed, the attributable risk is 100 percent. He was killed because he was working on that bridge. That is about the size of it.

I do not know because I have not made the calculations, but it would be possible to calculate how many cancers would arise in a group of, say, 100,000 workers in a nuclear plant given the kinds of doses that they receive. These are monitored workers so we are not in the unfortunate situation of having to multiply an estimated dose by a large factor in order to be safe. We know what the doses were pretty well.

Some proportion will get cancer. For some of them, the attributable risks may be high enough to warrant some kind of compensation. It will not be so for the great majority. As you know, the most common form of cancer among males—males are the majority of the workers—is lung cancer. You are never going to find the attributable risk for lung cancer to be very high, not because radiation does not cause lung cancer—it does—but cigarette smoking causes so much more lung cancer that the probability due to the radiation, especially in a smoker, is very low.

The CHAIRMAN. Is it not possible that if we can find and compensate the relatively few people who have been harmed by low levels of radiation, there will be less pressure to attempt to use safety regulations to create an absolutely risk-free situation which we all know is impossible to do since nothing in life really can be risk free?

Put differently, is it not true that compensating a person for a rare injury does not necessarily imply that the injury is any less rare? Might the method employed in our bill help stabilize radiation safety standards in a way that is both beneficial to the public health and to the welfare of the nuclear industry and defense program?

Mr. JABLON. Senator Hatch, I think what you have said is exactly right. If I did not say it in my testimony, I will say it now. I am entirely in favor of the approach of the bill. I am not talking about any specific numbers about which I have no special expertise, but I think the idea of using scientific information to assess the probabilities of harm—we can do it here; it is one of the rare cases in which we can do it—is an absolutely ideal way to go. I would hope

we would be able to do the same thing for other risky exposures at some time.

The CHAIRMAN. Thank you.

Senator Grassley?

Senator GRASSLEY. Thank you, Senator Hatch.

This bill requires an updating of the tables every 2 years. My question in regard to that is whether or not we should have any set of statutes of limitations and cutoff points of updating and the awards that go with them.

I suppose I also ought to ask if right in line with that is the presumption that if you do not have something or whether or not you should have it has with it the question of how many generations may be expected to be affected by what we are talking about here if there is a liability.

Dr. SINCLAIR. Mr. Grassley, I mentioned in my testimony that we constantly update risk estimates that are made. Because the human populations that we derive these numbers from keep giving us more information as they age, we are constantly updating. This is particularly true of the Japanese survivors of the atomic bombs.

I think the choice of 2 years is somewhat arbitrary. In general, we update the information from Japan in something more like 4 years and make these assessments over about the same time period.

The fact is that in time periods like that, our information is likely to get better and better. Therefore, I think that updating is certainly desirable.

Senator GRASSLEY. Not necessarily 2 years?

Dr. SINCLAIR. Not necessarily every 2 years.

Senator GRASSLEY. Do you have any judgment on the 2 years as opposed to some other period of time?

Dr. SINCLAIR. I would have preferred 4 years myself.

Mr. JABLON. If I may add something, I am not sure that even 4 is sufficiently long. As Dr. Sinclair has said, the Japanese data are ordinarily updated every 4 years, but I do not think that for purposes like this one is going to want to take the results as they come fresh from Japan.

The tradition has been, as exemplified in the BEIR report, that the Japanese data are considered by an expert committee in conjunction with all of the other data that are available. There is a pretty good body of other data.

For the denominator data which we get from the National Cancer Institute—their first publication has just come out and covers 5 years worth of data—I would not be surprised if the next one would not be in about the same kind of time period. You need a pretty good time period in order to collect enough numbers in order to get some stability and statistical accuracy.

I do not know whether 5 years or 6 years or what would be appropriate. When substantial data become available—and they will—then the tables should be updated.

Senator GRASSLEY. Dr. Bond?

Dr. BOND. There are a large number of individuals and groups who follow the available data rather closely. There has been a great deal of interest in this. Therefore, when the tables would need updating it would be well known within the scientific commu-

nity because the focus of attention is that sharp. What I am suggesting is that, rather than going by any canonical date perhaps the tables should be updated on the advice of some scientific group that is competent to make that judgment.

The need for updating is not necessarily a function of time. It is a function of whether there have been significant changes in the data, which would warrant significant changes in the tables. That is a scientific question. It is not determined by elapsed time.

Senator GRASSLEY. Dr. Bond, and if either of the other two want to respond, I would encourage them to do so, on a second question: Suppose that we would have a person whose condition would meet the proposed 10-percent probability level which defines the eligibility for compensation; can we say with any certainty what type of medical treatment can be anticipated? This question is related to my opening statement where I am trying to make a determination of our present Veterans' Administration system to be able to take care of some of these problems.

Dr. BOND. I personally see no relationship between the two. That is, the probability of causation is not a medical question. It is purely epidemiological and statistical.

With respect to the type of cancer itself, of course the diagnosis is a medical problem, strictly medical, as is the requirement for treatment and the actual treatment administered.

It is well known, and you certainly appreciate, that cancers differ in the degree of malignancy, if you will. A thyroid cancer, for instance, is a relatively benign malignancy while others, acute leukemia, are rapidly fatal diseases generally.

Certainly the treatments required will vary widely, but, again, I see no relationship between the two. They are separate questions and have to be judged against an independent set of criteria.

Mr. JABLON. I might add to that that I have just been looking at some estimates I made of the proportion of cancers of various kinds that would meet various criteria. At least in the Utah situation it is clear that the great majority of the cancers which will carry large attributable risks or probability of causation will be thyroid cancers.

As Dr. Bond told you, thyroid cancers usually are indolent. They do not grow very fast. They require surgery and they are certainly unpleasant to have, but they do not often kill people. Occasionally one goes wild and does.

A second form of cancer which will appear in radiated populations is breast cancer among females. Breast cancer is again a treatable cancer, but unfortunately it does kill a fair fraction of persons who have breast cancer. It requires surgery and very extensive medical care.

Finally you have leukemia. Leukemia unfortunately is a fairly fatal disease in most instances.

It is a very mixed bag. There will be some scattering of cancers of other kinds, but those are the three most important, I believe.

Senator GRASSLEY. Mr. Chairman, those are all the questions I have.

The CHAIRMAN. Thank you, Senator Grassley.

I want to thank you gentlemen for enlightening the committee here this morning as in the past. We appreciate the work you have

done and the statements you have given here this morning. Thank you so much.

[Material submitted for the record follows:]

NCRP REPORTS

Report 64	Influence of Dose & Its Distribution in Time on Dose-Response Relationships for Low-Let Radiations (1980)
Report 45	Natural Background Radiation in the United States (1975)
Report 68	Radiation Protection in Pediatric Radiology (1981)
Report 44	Krypton-85 in the Atmosphere -- Accumulation, Biological Significance, and Control Technology (1975)
Report 67	Radiofrequency Electromagnetic Fields -- Properties, Quantities and Units, Biophysical Interaction, and Measurements, (1981)
	Krypton-85 in the Atmosphere - With Specific Reference to the Public Health Significance of the Proposed Controlled Release at Three Mile Island (1980)

The CHAIRMAN. On our next panel will be Mr. Troy Wade, Deputy Assistant Secretary for Defense Programs, Department of Energy, and Lt. Gen. Harry Griffith, Director of the Defense Nuclear Agency.

Testimony from the administration arrived here so late as to allow no time for either myself or my staff to review it thoroughly. Thus I am not in a position to address this testimony in a manner that the seriousness of the issues involved here requires.

The administration has had a draft of our legislation for more than 1 month and my staff has briefed various departments of the administration concerning the legislation on numerous occasions.

In addition, my staff has been consulting with various administration agencies on this legislation since last October. The issues involved here are of vast importance and if I together with a small staff can develop the thoughtful and innovative approach to these issues, I think the least the administration can do with its far greater resources is to give us some timely comment.

I understand that the administration has no definitive opinion on either our bill or its approach, in large measure because the numerous officials and agencies who have a claim on the issue have not been able to come to an agreement among themselves. The Energy Department, the Defense Department, the Labor Department, Justice, the Veterans' Administration, HHS, OMB, and others all have an interest in this legislation. Apparently some people like what we are doing, some people do not, and some people would like a few more weeks, a few more months, or a few more years to consider the implications.

However, the nuclear explosions in question occurred 20 or more years ago. How long do people have to wait for a proper legal recourse?

Surely the issues involved are difficult. Surely our approach is novel and, I have to add, a bit bold. However, the science involved has long been established and the approach is not all that complex once you get the hang of it.

The implications are also fairly clearcut.

General, I would be happy to have you and Mr. Wade come to the table at this time. I think you will remember, General, our discussion at the last hearing at which the administration agreed it might support a compensation program as long as the merits of each case were considered on an individual basis and as long as compensation was targeted on those who were harmed. The administration pledged to work together with us toward that end and I think we have come pretty close, as close as science will allow us, in trying to reach those goals.

Considering how late the administration's formal testimonies arrived, I will ask the administration witnesses not to read the statements but to summarize for us the administration's position if you can. I wish you would dwell on the major concern before us, which is a consideration of the radioepidemiological attributable risk approach.

I realize the administration has specific complaints with specific provisions in our draft, but I think these differences can be worked out in due course. What we need to consider here is the basic approach.

Mr. Wade, I understand you are here specifically to represent the administration's position so why do you not begin.

STATEMENT OF TROY E. WADE, DEPUTY ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, DEPARTMENT OF ENERGY, ACCOMPANIED BY BRUCE W. CHURCH, DIRECTOR OF HEALTH PHYSICS, NEVADA OPERATIONS OFFICE, DEPARTMENT OF ENERGY; AND DR. LYNN R. ANSPAUGH, SECTION FOR ANALYSIS AND ASSESSMENT ENVIRONMENTAL SCIENCES DIVISION, LAWRENCE LIVERMORE NATIONAL LABORATORY

Mr. WADE. Thank you, Mr. Chairman, Senator Grassley.

I am Troy Wade. I am Deputy Assistant Secretary of Energy for Defense Programs. I am pleased to present a summary of our testimony before this joint session today, and I would like to submit our full statement for the record.

I am pleased to have with me at the table Mr. Bruce Church, who heads up the Health Physics Division of our Nevada Operations Office, and Dr. Lynn Anspaugh from the Lawrence Livermore National Laboratory. It is particularly important that these two gentlemen are here again today because they are the project manager and the scientific director, respectively, of our dose reassessment project in Nevada with which you are familiar.

We are aware of the committee's desire to compensate any individual who has developed cancer as a result of exposure to radiation from the atmospheric tests. Most would agree that the Government should, through the courts or through some other mechanism, provide some form of compensation in individual cases where causation is probable.

However, we cannot at this time support the concept of a legislative remedy, nor do we support compensation to individuals by the Federal Government without adequate evidence of causation.

There are great difficulties in arriving at an equitable solution. As you pointed out in your opening statement, Mr. Chairman, a fundamental difficulty arises in distinguishing those few individuals who may have developed cancer as a result of the Nevada tests from the many more who have developed cancer from other causes.

The task force on Compensation for Radiation Related Illnesses concluded that in the downwind population of the order of 172,000, the total number of cancers which might be related to radioactive fallout is of the order of 9 to 96, of which 3 to 32 could be fatal.

As Mr. Jablon stated, the incidence of cancer in the downwind population that may be due to atmospheric testing is, therefore, small.

The original S. 1483 did not distinguish deserving individuals. Instead it would have provided compensation to all individuals with certain types of cancer in various geographic areas. As you are aware, we strongly opposed this approach.

This redraft of S. 1483, which incorporates the attributable risk concept, offers, for the first time in our view, a framework for calculating the probability that any given individual with cancer has developed that cancer as a result of the Nevada tests.

The preliminary draft tables that have been developed by a committee of the NCRP and so professionally represented by Dr. Bond are very important. They have not yet received the NCRP formal review. They have not yet received a Department of Energy or any other review.

We feel that these tables are so fundamental to the fair and equitable application of the attributable risk method that these reviews are absolutely essential. These reviews will take some time, but in our view they are absolutely essential.

For the committee to recognize the attributable risk methodology as a guide for identifying those harmed by radiation is, we believe, a very noteworthy change in the treatment of the issue. We applaud that.

We are concerned about other aspects in the current draft of the legislation, such as the multiplication of the dose by an arbitrary factor; the award of compensation based upon a low percentage of attributable risk; the formula for the amount of compensation; and, very importantly to us, the unknown consequences of this legislation on the nuclear weapons program and other nuclear programs.

We recognize the importance of the accurate determination of dose. As you are aware, Mr. Chairman, the DOE in Nevada is currently engaged in an extensive program of radiation dose reassessment. We believe that the completion of this task will help to resolve ambiguities and uncertainties as to the doses received. There will inevitably be uncertainties, but the completion of the dose reassessment program is also key to the solution to this compensation issue.

As I stated, the Department is concerned about the implications of this legislation on its own operations and on the nuclear industry. We have not had time to fully study and understand these consequences. We have initiated a study to determine the impact on the radiation protection standards as they may apply to Department of Energy responsibilities.

It will be necessary to evaluate the underlying assumptions on which the attributable risk tables are based before we can truly understand those impacts. We also note that such a precedent might be applied beyond the area of radiation exposure to toxic substances.

In closing, Mr. Chairman, we believe there are many aspects of the attributable risk concept which deserve further study. We cannot, however, support the concept of a legislative remedy without a much better understanding of the attributable risk tables. Nor do we support compensation to individuals by the Federal Government without adequate evidence of causation.

I thank you for the opportunity to testify. I apologize for the lateness of the administration's testimony. I am prepared to answer any questions that you or Senator Grassley may have.

[The prepared statement of Mr. Wade follows:]

97-779 O—82——5

STATEMENT OF TROY E. WADE

DEPUTY ASSISTANT SECRETARY FOR DEFENSE PROGRAMS

DEPARTMENT OF ENERGY

Mr. Chairmen, and members of the Committees, I am Troy Wade, Deputy Assistant Secretary for Defense Programs, Department of Energy. The Department is pleased to present testimony before the joint session of the Senate Labor and Human Rescurces Committee and the Senate Committee on the Judiciary regarding the latest Committee redraft of S.1483, "The Radiation Exposure Compensation Act of 1981."

From 1951 to 1962, except for a three year moratorium, the United States conducted atmospheric nuclear tests at the Nevada Test Site. This program resulted in radiation exposure to the population in areas downwind which may have caused a small increase in the incidence of cancer within that population.

We are aware of the Committees' desire to compensate any individual who has developed cancer as a result of exposure to radiation from the atmospheric tests at the Nevada Test Site. Most would agree that the government should, through the courts or through some other mechanism, provide some form of compensation in individual cases where causation is probable. However, we cannot at this time support the concept of a legislative remedy, nor do we support compensation to individuals by the Federal Government, without adequate evidence of causation. We are continuing to study whether there should be a departure from the

presently existing mechanisms for compensation. A fundamental difficulty arises in distinguishing those few individuals who may have developed cancer as a result of the Nevada tests from the many more who have developed cancer from other causes. Unfortunately, it is impossible medically to distinguish a cancer induced by radiation from a similar cancer not so induced. To put this matter in perspective, mortality statistics show that in the United States approximately one in six people die of cancer. The Task Force on Compensation for Radiation Related illnesses concluded that in the downwind population of 172,000, the total number of cancers which might be related to radioactive fallout is in the order of nine to ninety-six of which three to thirty-two might be fatal. Some 35,000 to 45,000 cancer cases would be expected in this population without the added radiation exposure. Of these, some 25,000 to 30,000 would be fatal. The uncertainties in the number of radiation-related cancers were due to uncertainties such as the population dose and the risk coefficients of cancer induction by radiation. The basic point, however, is that the incidence of cancer in the downwind population that may be due to atmospheric testing is very small.

The original S.1483 did not distinguish deserving individuals. Instead, it would have provided compensation to all individuals with certain types of cancer in various geographical areas. We strongly opposed this approach in testimony before the Committee on Labor and Human Resources of the Senate on October 27, 1981.

The redraft of S.1483 incorporates the "attributable risk" concept, which is a possible tool to identify individuals who would be most likely to have radiation induced cancers. Within the limits of the assumptions used, the "attributable risk" method offers a framework for calculating a probability that any given individual with cancer has developed that cancer as a result of radiation from the Nevada tests. This probability must take into consideration certain pertinent factors, e.g., sex, age at time of exposure, and interval between exposure and onset of the disease. Preliminary draft tables of "attributable risk" are being developed by a Committee of the National Council for Radiation Protection and Measurements (NCRP), but we understand that these tables have not yet been formally reviewed or approved by the group; nor has the Department of Energy had the opportunity to review them. The tables are so fundamental to the fair and equitable application of the "attributable risk" method that these reviews are absolutely essential, and will take some time.

It should be noted that the "attributable risk" tables in their present form, do not represent a "best estimate" of the probability a given cancer was caused by radiation, but rather something closer to an "upper bound." This is because the basic equations currently used in deriving risk coefficient values may significantly overestimate the number of cancers caused by a low dose of radiation.

This conservatism is proper when devising radiation standards for worker safety, but may not be as appropriate when trying to predict the actual health effects of low doses of radiation on the public. However, at higher doses comparable to amounts received by survivors of Hiroshima and Nagasaki, the risk coefficient values would be expected to become increasingly accurate. It must be emphasized that these observations are not at all a criticism of "attributable risk" as a concept, but rather a caution that the underlying assumptions currently used in deriving "attributable risk" values need to be examined more closely than they have been to date. In order to evaluate the merits of any compensation scheme, it is essential that a "best estimate" of the numbers of actual cancers be attempted in various segments of the population (e.g., age groups), rather than to rely only on "upper bound" values.

For the Committees to recognize this methodology as a guide for identifying those harmed by radiation is, we believe, a very noteworthy change in the treatment of the issue. Having said that, I would like to express some of the Department's additional concerns about the current draft of S.1483. Among our concerns are: multiplication of the estimated dose to a claimant by an arbitrary factor, the award of compensation based upon a low percentage of "attributable risk", the formula for amount of compensation, the draft's exclusive remedy provision, and the largely unknown consequences for the continued operation of the nuclear weapons program and other government operations.

We recognize the importance of the accurate determination of dose and are currently engaged in an extensive program of radiation dose reassessment. We believe that the completion of this task will help to resolve ambiguities and uncertainties as to the radiation doses received. We believe also that the resultant dose determination will be scientifically as sound as is possible, given the amount of available data. It must be realized, however, that there will inevitably be appreciable uncertainty in the actual radiation doses received by a particular individual due to the lack of specific documentation of individual exposures, and of the concentration of radionuclides in local food chains.

The Department is particularly concerned about the implications on its operations, and the commercial nuclear industry if the precedent were established to use arbitrary dose multipliers in conjunction with a concept of "attributable risk", particularly if the threshold of compensation is set at a low level of risk. Such a precedent would lead not only to unwarranted windfalls but possibly could force the unjustified lowering of radiation protection standards. In this regard it is our understanding that the redraft of S.1483 is intended to include workers at the Nevada Test Site at the time of the nuclear tests, including DOE and contractor personnel. We would like to point out that radiation exposure of these

workers were individually monitored and exposures controlled within prescribed limits. Radiation monitoring methods provide highly reliable dose assessments and are not associated with many of the uncertainties involved in calculating doses of the general public. If the precedent were established to arbitrarily raise the assumed dose because of uncertainties in doses received, or lower the threshold for compensation, (i.e., below 51%) it could allow an unjustified windfall, and could eventually necessitate the unwarranted lowering of radiation protection standards within the weapons program and the nuclear industry in general. This could result in serious operational difficulties within the nuclear weapons R&D, testing, and production complex. For example Defense Programs' contractors employ over 50,000 workers nation-wide. Redesign of work environments for these employees to accommodate unnecessarily low standards would present a substantial financial burden. We have not had time to fully study these consequences. Currently we are initiating a study to determine the impact on radiation protection standards. There could also be a major negative impact on the entire civilian industry including nuclear power plant operations. As we have stated before, it will be necessary to evaluate the underlying assumptions on which the "attributable risk" tables are based. We note too that such a precedent might be applied beyond the area of radiation exposure to toxic substances.

The redraft also attempts to increase the likelihood that all injured persons would be covered by setting the threshold for inclusion at a low level of "attributable risk." The Department opposes the use of a low "attributable risk" threshold as a standard for compensation whether through the courts or through specific legislation.

Another matter of concern is that the formula for compensation does not consider the extent of the injury. For example, it makes not distinction between fatal and non-fatal cancers, but merely awards arbitrary amounts based on the "attributable risk." Our position is that any compensation scheme should be reasonably related to the actual cost incurred (e.g., medical expenses not insured and lost income from illness) by the individual claimant up to a maximum amount.

In closing, we believe that there are many aspects of the "attributable risk" concept which deserve further study. However, we cannot at this time support the concept of a legislative remedy, nor do we support compensation to individuals by the Federal Government, without adequate evidence of causation. Again, I thank you for the opportunity to testify on this important matter, and I am prepared to answer any questions the Committee may have.

The CHAIRMAN. Thank you.
General Griffith?

STATEMENT OF LT. GEN. HARRY A. GRIFFITH, DIRECTOR, DEFENSE NUCLEAR AGENCY, DEPARTMENT OF DEFENSE, ACCOMPANIED BY DR. DAVID AUTON, OPERATIONS RESIDENT ANALYST; AND ROBERT BRITTIGAN, GENERAL COUNSEL

General GRIFFITH. Thank you, Mr. Chairman and Senator Grassley.

It is a privilege for me to be able to appear once again before you today to present the views of the Department of Defense with respect to the Atomic Bomb Fallout Compensation Act of 1982.

I have with me at the table Mr. Robert Brittigan, my general counsel, and Dr. David Auton of my staff.

I have submitted prepared testimony for inclusion in the record and would like to take this opportunity to briefly summarize those comments.

Clearly the Atomic Bomb Fallout Compensation Act of 1982 as proposed is an improvement over S. 1483 about which I testified on October 27, 1981, because it attempts to correlate compensation with the degree of exposure and resulting increased risk.

However, we think that further work is required because the proposed legislation raises two principal questions. The first and most fundamental question is whether it is appropriate to enact a statute directly basing Federal liability upon an attributable risk calculation. This unprecedented approach has far-reaching implications not only with respect to radiation claims but other potential environmental exposures.

We have not had adequate time to evaluate this significant issue and must therefore withhold judgment on the merits of this approach.

The second question is whether the specific provisions of the proposed legislation are workable. The answer to that, we believe, is clearly no because of the following major problems.

The most important practical problem is that the proposed legislation would base liability upon radioepidemiological tables which do not yet exist. Without such tables it is impossible to determine whether the proposed legislation would first meet the purposes for which it is intended; second, compensate an appropriate number of people in light of the actual expected excess incidence of disease; third, adversely impact current radiological safety standards in operations; and, fourth, place an unacceptable burden on the Federal budget.

Next, the legislation is proposed as an amendment to the Federal Tort Claims Act. Since the proposed legislation is really a no-fault, partial causation, fixed compensation special relief bill more analogous to workers compensation or VA benefits, it should not be grafted to the Federal Tort Claims Act. Doing so would raise unnecessary questions concerning the applicability of well-established judicial precedent and may have unexpected effects upon normal Federal tort litigation.

Finally, dose assessment is the most significant variable under the proposed legislation. Although many studies are in progress to

resolve this problem, the complete results of those efforts are not yet available. Adequate dose information is obviously as important as the attributable risk tables in evaluating the proposed legislation.

In conclusion, it is premature to make a determination regarding the attributable risk approach. While there is a need for a rational connection between risk and compensation, this is a difficult problem and there are many unknowns. The scientific community is not in total agreement regarding the health effects associated with low levels of ionizing radiation. A great deal of uncertainty surrounds the dose assessments.

The attributable risk tables have neither been created nor subjected to appropriate review. Until the problems I have mentioned here and commented upon in my prepared testimony are resolved, the Department of Defense cannot support the proposed legislation.

Thank you very much, sir. I would be happy to answer any questions.

[The prepared statement of General Griffith follows:]

STATEMENT OF

LTG HARRY A. GRIFFITH, USA

DIRECTOR, DEFENSE NUCLEAR AGENCY

Mr. Chairman and Members of the Committees:

I am pleased to appear before you today to present the views of the Department of Defense with respect to the Atomic Bomb Fallout Compensation Act of 1982. I understand that your staff has continued to work on the proposed legislation and the February 3, 1982 draft upon which my testimony is based, may not be the most recent iteration. Nevertheless, my comments are general in nature and should not be materially affected by any minor changes which may have been made.

The DoD has great sympathy for any family which experiences catastrophic illness. We are not opposed to compensation for individuals who may have legitimate claims and are deserving of relief. We also recognize that some downwind residents were exposed to fallout from nuclear weapons tests at the Nevada

TEST SITE (NTS), AND THAT SOME OF THESE INDIVIDUALS MAY HAVE SUFFERED ADVERSE HEALTH EFFECTS FROM THIS EXPOSURE.

ALTHOUGH THE ATOMIC BOMB FALLOUT COMPENSATION ACT OF 1982 IS AN IMPROVEMENT OVER SENATE 1483 ABOUT WHICH I TESTIFIED ON OCTOBER 27, 1981 DoD STILL OPPOSES ITS ENACTMENT AT THIS TIME. THE COMPENSATION ACT ATTEMPTS TO CORRELATE COMPENSATION WITH EXPOSURE AND THE RESULTING INCREASE IN RISK. WHILE THE ATTRIBUTABLE RISK APPROACH IS VERY INTERESTING AND WARRANTS FURTHER STUDY, THE IMPLICATIONS OF LEGISLATING COMPENSATION ON THIS BASIS REMAIN FAR-REACHING. IT IS INAPPROPRIATE TO IMPOSE LIABILITY UPON THE GOVERNMENT THROUGH A STATUTORY SYSTEM OF ATTRIBUTABLE RISK WHEN THE IMPACT WITH RESPECT TO BOTH RADIATION AND OTHER POTENTIAL ENVIRONMENTAL EXPOSURES IS UNKNOWN.

WE HAVE IDENTIFIED SEVERAL QUESTIONS RAISED BY THE FEBRUARY 3, 1982 DRAFT. SINCE THE OPERATION OF THE PROPOSED LEGISLATION WOULD DEPEND ENTIRELY UPON TABLES WHICH HAVE NOT AS YET BEEN

PUBLISHED, IT IS IMPOSSIBLE TO ACCURATELY ASSESS THE IMPACT OF THE ACT IN TERMS OF EITHER THE BUDGET OR EXISTING RADIOLOGICAL SAFETY STANDARDS. THE SCIENTIFIC COMMUNITY IS NOT TOTALLY IN AGREEMENT WITH RESPECT TO THE HEALTH EFFECTS ASSOCIATED WITH EXPOSURES TO LOW LEVELS OF IONIZING RADIATION. UNCERTAINTY REMAINS WITH RESPECT TO THE ACTUAL EXPOSURES WHICH MAY HAVE BEEN EXPERIENCED BY THE OFFSITE RESIDENTS. THE PROBLEM IS FURTHER COMPLICATED BY THE NEED TO MAKE CERTAIN ASSUMPTIONS REGARDING AGE AT TIME OF EXPOSURE, AGE AT ONSET OF DISEASE, AND DISTRIBUTION OF DISEASE INCIDENCE WITHIN THE POPULATION OF INTEREST.

WE HAVE BEEN GIVEN THE OPPORTUNITY TO REVIEW SOME PRELIMINARY DATA WHICH HAS BEEN FURNISHED TO THE COMMITTEES AND MAY OR MAY NOT ULTIMATELY BE ADOPTED BY THE SECRETARY OF HEALTH AND HUMAN SERVICES. WHEN WE COMPARED OUR PRELIMINARY RESULTS WITH THE CURRENT BEST ESTIMATES OF THE NUMBER OF EXCESS CANCERS ACTUALLY EXPECTED AS A RESULT OF THE RADIATION EXPOSURES, WE FOUND THAT THE NUMBER OF COMPENSABLE CASES UNDER THE ACT FAR EXCEEDED THE NUMBER OF EXPECTED CASES.

A FAR MORE PRESSING CONCERN ABOUT THE PROPOSED LEGISLATION IS THE POTENTIAL IMPACT UPON EXISTING RADIOLOGICAL SAFETY STANDARDS. IF AN UNREALISTICALLY LOW ATTRIBUTABLE RISK IS SELECTED AS THE COMPENSABLE LEVEL, THE ACT WOULD INEVITABLY DRIVE THE EXISTING STANDARDS DOWNWARD WITH POTENTIALLY SEVERE EFFECTS UPON NATIONAL NUCLEAR PROGRAMS. OUR NATION IS HEAVILY DEPENDENT UPON THESE ACTIVITIES WHICH NECESSARILY INVOLVE THE EXPOSURE OF WORKERS TO LOW LEVELS OF IONIZING RADIATION. EXAMPLES INCLUDE RESEARCH, MEDICAL AND DENTAL PROCEDURES, NUCLEAR POWER, INDUSTRIAL RADIOGRAPHY, NUCLEAR PROPULSION, NUCLEAR WEAPONS, AND NUCLEAR WEAPONS TESTING. MILLIONS OF WORKERS HAVE BEEN AND WILL CONTINUE TO BE OCCUPATIONALLY EXPOSED WHILE PERFORMING THESE VITAL TASKS. ALL OF THE PROGRAMS ARE CAREFULLY STRUCTURED TO COMPLY WITH THE CURRENT RADIATION EXPOSURE GUIDELINES RECOMMENDED BY NATIONAL AND INTERNATIONAL ORGANIZATIONS AND ESTABLISHED BY THE FEDERAL GOVERNMENT--GUIDELINES WHICH ARE BASED UPON THE CONSIDERED JUDGMENT THAT RADIATION EXPOSURE WITHIN RECOMMENDED LIMITS REPRESENTS A SMALL AND ACCEPTABLE RISK.

COMPENSATION AT THE LEVELS SET IN THE BILL CREATES THE ERRONEOUS IMPRESSION THAT LOW LEVELS OF IONIZING RADIATION PRESENT SIGNIFICANT HAZARDS TO HEALTH. THAT IMPRESSION, WHICH IS CONTRARY TO THE WIDELY HELD AND THOROUGHLY DOCUMENTED VIEWS OF THE SCIENTIFIC AND MEDICAL COMMUNITIES, WOULD SEVERELY DISRUPT THESE VITAL PROGRAMS IN FOUR WAYS.

FIRST, THE LARGE POPULATION WHICH HAS BEEN AND IS NOW BEING OCCUPATIONALLY EXPOSED TO LOW LEVELS OF IONIZING RADIATION WILL BE ENCOURAGED TO FILE CLAIMS AGAINST THE GOVERNMENT AND INDUSTRY ALLEGING THAT THEIR PARTICULAR DISEASE OR AILMENT WAS CAUSED BY THEIR RADIATION EXPOSURE. REGARDLESS OF THE OUTCOME OF THESE CLAIMS, THEY WILL CLEARLY PLACE A HEAVY BURDEN UPON THE DEPARTMENT OF LABOR, THE VETERANS ADMINISTRATION, THE DEPARTMENT OF JUSTICE, THE FEDERAL COURTS, AND OTHER GOVERNMENT AGENCIES.

SUCH COMPENSATION COULD ADVERSELY AFFECT THE MANPOWER POOL AVAILABLE TO NUCLEAR ACTIVITIES. CURRENT WORKERS MAY

BE HESITANT TO CONTINUE EMPLOYMENT SINCE THEIR PERCEPTION WOULD BE THAT THE WORK IS UNDULY HAZARDOUS. ADDITIONALLY, RECRUITMENT OF QUALIFIED WORKERS MAY BE DIFFICULT, IF NOT IMPOSSIBLE. THE POTENTIAL LOSS OF MANPOWER WOULD STAGNATE THE NUCLEAR PROGRAMS.

THIRD, BY COMPENSATING INDIVIDUALS WHOSE EXPOSURES WERE EXTREMELY LOW WOULD INEVITABLY CREATE PRESSURE TO REDUCE ALLOWABLE EXPOSURE LIMITS. ANY SUCH REDUCTION WOULD HAVE A DIRECT AND IMMEDIATE IMPACT UPON NUCLEAR PROGRAMS DESCRIBED ABOVE. DEPENDING UPON THE EXTENT OF THE REDUCTION, SOME OF THE ESSENTIAL ACTIVITIES COULD BE CONTINUED ONLY WITH GREATLY INCREASED COST WHILE OTHERS COULD NOT BE CONTINUED AT ALL.

FINALLY, THE IMPRESSION CREATED WOULD INCREASE THE ANXIETY OF THE GENERAL PUBLIC--ITSELF AN UNDESIRABLE PHENOMENON--AND THEREBY INCREASE RESISTANCE TO PRODUCTIVE AND NECESSARY PROGRAMS. EFFECTIVE MEDICAL CARE, CONTINUED DEVELOPMENT OF NUCLEAR POWER

AND OUR ABILITY TO DEPLOY NUCLEAR WEAPONS AT HOME AND ABROAD COULD ALL BE ADVERSELY AFFECTED. THEREFORE, IT HAS VAST POTENTIAL FOR UNFORESEEN AND UNDESIRABLE CONSEQUENCES IN OTHER AREAS.

THE PROPOSED LEGISLATION WOULD AMEND THE FEDERAL TORT CLAIMS ACT TO ESTABLISH A NO FAULT, PARTIAL CAUSATION, FIXED COMPENSATION SYSTEM MORE ANALOGOUS TO WORKMAN'S COMPENSATION OR VETERANS BENEFITS THAN TO TRADITIONAL TORT LITIGATION. THE ONLY CONTESTED ISSUE IN INDIVIDUAL CASES WOULD APPEAR TO BE THE EXTENT OF RADIATION EXPOSURE AND NO PROCESS OTHER THAN THE NORMAL ADMINISTRATIVE TORT CLAIM PROCEDURE IS ESTABLISHED TO RESOLVE THIS ISSUE OUTSIDE OF COURT. THE STANDARD OF PROOF ESTABLISHED IN SECTION 2696(A) OF THE DRAFT, "A REASONABLE LIKELIHOOD THAT HE RECEIVED THE LEVEL OF EXPOSURE CLAIMED TO HAVE BEEN RECEIVED," IS UNPRECEDENTED IN THE CONTEXT OF FEDERAL TORT LITIGATION. USE OF THE FEDERAL TORT CLAIMS ACT AS A VEHICLE

97-779 O—82——6

FOR THIS LEGISLATION WOULD RAISE QUESTIONS CONCERNING THE APPLICABILITY OF TRADITIONAL TORT JURISPRUDENCE TO THESE SPECIAL CASES. A GOOD EXAMPLE IS THE DOCTRINE ENUNCIATED IN FERES V. UNITED STATES, 340 U.S. 135 (1950), WHICH GENERALLY PRECLUDES RECOVERY FOR INJURIES RECEIVED INCIDENT TO MILITARY SERVICE. IT IS UNCLEAR WHETHER THE AUTHORS INTEND TO INCLUDE OR EXCLUDE SERVICE MEMBERS UNDER THE ATOMIC BOMB FALLOUT COMPENSATION ACT OF 1982. SIMILAR QUESTIONS ARISE WITH RESPECT TO FEDERAL CIVILIAN EMPLOYEES COVERED BY THE FEDERAL EMPLOYEES' COMPENSATION ACT AND CONTRACT EMPLOYEES COVERED BY WORKMAN'S COMPENSATION. DISPUTES MAY ALSO ARISE ABOUT THE APPLICABILITY OF THE SPECIAL RULES DESIGNED FOR THESE CASES TO TRADITIONAL TORT LITIGATION. THIS ACT SHOULD BE RECOGNIZED AS THE SPECIAL RELIEF LEGISLATION THAT IT CONSTITUTES.

THE MOST CRITICAL FACET OF IMPLEMENTATION WILL REST IN DOSE ASSESSMENT. THE PROPOSED LEGISLATION EXACERBATES THE DOSE ASSESSMENT PROBLEM BY PROVIDING, IN SECTION 2696(D) THAT

"THE COURT HEARING THE MATTER SHALL NOT ACCORD A PRESUMPTION OF VALIDITY TO THE GOVERNMENT REGARDING SCIENTIFIC DATA AND FINDINGS FROM FEDERAL SOURCES BEARING ON THE LEVELS OF EXPOSURE." INASMUCH AS MOST OF THE RESEARCH IN THIS AREA HAS BEEN PERFORMED OR FUNDED BY THE GOVERNMENT, IT IS DIFFICULT TO DISCERN ON WHAT BASIS A REASONABLY ACCURATE DOSE ESTIMATE COULD BE MADE WITHOUT REFERENCE TO INFORMATION DERIVED FROM GOVERNMENT SOURCES.

THE PRELIMINARY DRAFT DOES NOT TAKE INTO ACCOUNT THE FACT THAT THE VARIOUS POSSIBLE HEALTH EFFECTS HAVE SIGNIFICANTLY DIFFERENT IMPACTS UPON THE INDIVIDUAL CONCERNED IN TERMS OF BOTH MEDICAL COST AND SERIOUSNESS OF RESULT. REMOVAL OF A THYROID NODULE IS A NON LIFE THREATENING SURGICAL PROCEDURE WHILE LEUKEMIA CAN BE A TERMINAL ILLNESS INVOLVING CATASTROPHIC MEDICAL EXPENSES.

IN SUMMARY, MR. CHAIRMAN, THE DOD DOES NOT SEEK TO BAR COMPENSATION FOR THOSE WHO MAY HAVE LEGITIMATE CLAIMS. HOWEVER, THE DOD BELIEVES THIS LEGISLATION IS INAPPROPRIATE AT THIS TIME AND COULD BE EXTREMELY DAMAGING TO ESSENTIAL NUCLEAR PROGRAMS AND ACTIVITIES.

THIS CONCLUDES MY PREPARED REMARKS.

THANK YOU VERY MUCH, MR. CHAIRMAN.

LIEUTENANT GENERAL HARRY A. GRIFFITH, U.S. Army
DIRECTOR
DEFENSE NUCLEAR AGENCY

General Griffith was born on 4 August 1924 in Boonton, New Jersey. He attended the United States Military Academy and graduated in 1949.

His early assignments include tours as a company commander and assistant battalion executive officer of the 2d Engineer Battalion, duty as a tactical officer at the United States Military Academy and service with the Engineer District at Ft. Wainwright, Alaska. He also served as aide-de-camp to Commander, U.S. Army, Europe. In 1955 he received a master's degree in civil engineering from California Institute of Technology. He is also a graduate of the Army Command and General Staff College, the Armed Forces Staff College, and the National War College.

General Griffith commanded the 27th Engineer Battalion at Fort Campbell, Kentucky, and the 35th Engineer Group (Construction) in Vietnam. In 1970, he was the District Engineer of the U.S. Army Engineer District in Mobile, Alabama and later the Division Engineer of the U.S. Army Engineer Division Southwestern in Dallas, Texas. He was promoted to Brigadier General in June, 1973.

In 1974 he was assigned as Director of Research, Development and Engineering, in the U.S. Army Materiel Development and Readiness Command. He was promoted to Major General in March, 1976. He became the Chief of the Joint United States Military Assistance Group-Korea in 1977 and served in Korea until August 1979. He next was assigned as division engineer for the U.S. Army Engineer Division, Ohio River in Cincinnati, Ohio. In August 1980 he was nominated to be the Director, Defense Nuclear Agency and for promotion to the rank of Lieutenant General. He assumed command as Director, Defense Nuclear Agency on 19 August 1980, and he was promoted to Lieutenant General on 11 September 1980.

General Griffith holds an honorary Doctorate of Military Science from Norwich University, awarded in May 1981.

General Griffith's military awards and decorations include the Defense Distinguished Service Medal, the Legion of Merit with two Oak Leaf Clusters, the Bronze Star Medal, the Air Medal, the Army Commendation Medal with Oak Leaf Cluster and the Expert Infantry Badge.

General Griffith is married to the former Ann Buckley, and they have six children: Betsy, Harry, Paul, Mary, John and Joe.

MARCH 1982

The CHAIRMAN. Thank you.

I will ask my questions and both of you can comment on them.

Does the administration question the validity of the science of epidemiology and attributable risk? It appears to me that they are established concepts in our science today.

Mr. WADE. No, sir. We do not question the validity. However, the statutory establishment of Federal liability based upon attributable risk and radioepidemiological tables that do not exist is a new concept. We believe that we need to better understand the implications. We also believe we need to complete the dose reassessment work that is ongoing in Nevada before we can arrive at an overall formula for solving this problem.

The CHAIRMAN. How much time do you think that would take? You see, I am concerned about not only those who have already died, but also their families dying before we do anything to fulfill justice here.

Mr. WADE. Mr. Chairman, I cannot really speak——

The CHAIRMAN. Can you give us an estimate—1 year, 1½, 2 years, 3 years, 10 years, 100 years?

Mr. WADE. No, no. I would say 2 years or less. We will complete our work in Nevada in another year, and I would guess that the NCRP review and the other reviews of the attributable risk tables will be done in the same timeframe.

The CHAIRMAN. Can you think of another method in addition to the use of radioepidemiology and attributable risk that would enable us to determine those individuals who are most likely to have developed cancer from the fallout? Can you think of a superior method?

Mr. WADE. No, sir, I think we cannot.

The CHAIRMAN. So this is as good a method as we could possibly use?

Mr. WADE. We believe that may be the case, subject to appropriate review.

The CHAIRMAN. Do you agree, General?

General GRIFFITH. I think the Federal Tort Claims Act as it exists, if the individual could prove that his exposure is the cause of his cancer, is an existing recourse. Of course this is a new approach and I think it will take further deliberation.

I think there is a third aspect to it though. It is not a scientific or a technical question. It is more or less a political and a social judgment on what the implications of this approach would be.

The CHAIRMAN. Does the Department of Energy or the Department of Defense know of a method of discerning precisely which individuals have radiation-generated cancers?

Mr. WADE. No. I think there will never be a precise method for determining that.

The CHAIRMAN. Do you agree with that, General?

General GRIFFITH. I do agree.

The CHAIRMAN. Much has been made of the fact that we would compensate people who would not likely be able to win their cases if those cases involved other non-radiation hazards. We are not asking that cancer victims prove that it is more likely than not that their cancer is radiation generated, but only that there is at

least a 1 in 10 scientifically determined probability that their cancer was caused by the Nevada fallout.

This is supposed to set some dreadful precedent, but the fact is we balance this change and the standard of proof with prorated damages as well. Thus a person with a low compensable attributable risk receives a smaller award than a person with a high attributable risk.

In a sense, we are spreading the damages around in a situation in which we cannot be sure which individuals have been harmed and we are limiting the total exposure of the Federal Government in this particular matter. Of 10 people each with a 10-percent attributable risk, 1 person is likely to have a fallout-generated cancer.

Do you think that that arrangement is a fair one rather than having an arrangement like we had before with unlimited liability on the part of the Government?

Mr. WADE. As I stated, I think we believe that the use of the attributable risk methodology is an improvement over the earlier method of compensating by geographical area. Our concern, Mr. Chairman, is not with the number of people who may be compensated but with the formula used. If compensation is provided for at the low end of the attributable risk tables, it is not clear to us that that will not have a negative impact on the rest of our operations and perhaps on the nuclear industry in this country. This is why we want to make sure the attributable risk or probability of causation method is the one that is scientifically judged to be the best.

The CHAIRMAN. In this matter you are not concerned about the total damages that would be assessed to the Government in this particular situation? We have limited them.

Mr. WADE. I believe that this attributable risk approach provides a far more equitable basis for providing compensation to people who may have been injured by the fallout than compensating by geographic area.

The CHAIRMAN. Do you agree, General?

General GRIFFITH. I think it is a good approach. As I said, sir, I think we need some better data and some better opportunity to really consider all the implications.

The CHAIRMAN. General Griffith, at our last hearing it was your opinion and the administration's opinion that our original bill would have covered too many people and would have cost too much.

What is your opinion of the number of people who would likely be able to win damages under the new draft, and what is your opinion concerning the cost of this legislation?

I remind you that you testified that the average dose per 175,000 downwind citizens was a half rad. National Academy of Science scientists have estimated for us that if the organ dose for 175,000 downwind citizens was five rads, that is more than 10 times your estimate since your estimate is for the whole body dose with five rads. They would say 333 people are likely to win damages at a cost of some $35 million. Almost all of these people would have either acute leukemia or bone cancer, thyroid cancer, or breast cancer.

How many citizens do you estimate would win damages under our legislation and how much do you estimate this legislation

would cost the Government in damages? If you cannot give me the exact figure, would you say more or fewer than 333 people would be covered?

General GRIFFITH. Sir, I do not really feel we know the answer to that question yet. That is one of the reasons we need more time to fully analyze. As Dr. Sinclair said, what Mr. Jablon first came up with was very much a first draft and it would take a fair amount of peer review and arguing and discussion in order to agree on what would constitute a reasonable table. I think the kinds of questions you are talking about would be table sensitive. This is one of the reasons why we think it is premature.

The CHAIRMAN. Mr. Wade, would you care to comment on that?

Mr. WADE. I would agree, sir. I believe it would not be productive at this point to speculate on the numbers. Any speculation could be off by orders of magnitude.

The CHAIRMAN. Would you not agree with me that even if this is too low by three times we would still be talking about less than 1,000 people?

Mr. WADE. That is my understanding of Mr. Jablon's tables; yes, sir.

The CHAIRMAN. It seems that whenever implications of this legislation or other radiation liability cases are discussed, large numbers of potentially covered people are bandied about. One would think that 200,000 military personnel who have been involved with our nuclear testing program and thousands of civilian workers in the nuclear power industry would become eligible for damages if the method of this legislation became applied to these other cases.

We all know that this is nonsense. First of all, one can see by considering the people who will be eligible under our legislation that there are only a few types of cancers that are likely to lead to compensable attributable risks.

The first question is how many of the 200,000 soldiers and the several thousand civilians have these few cancers.

General GRIFFITH. Sir, I would like to furnish that for the record.

The CHAIRMAN. Let me give you a second question, too.

How many of these people were exposed to a significant dose of radiation? Does not the military claim that very few of our soldiers have been exposed to such radiation?

General GRIFFITH. I think the answer to that question hinges around what you would call significant radiation. If I may, sir, I would like to furnish that for the record.

The CHAIRMAN. I would think unless the military and the nuclear industry are wildly wrong in their estimates of the doses people have received, that the number of people who would win damages if our legislation were generalized for all radiation cases would not be that large.

The people who would win damages, the prorated damages, would deserve them. How many people does the administration estimate would be eligible for compensation if our bill were applicable to other radiation liability cases?

If this bill passes, how many people do you estimate would be eligible for compensation?

General GRIFFITH. Again, sir, as I said earlier, I would like to furnish it for the record because so much of what we are talking

about is going to be dependent upon the final tables and how they turn out and so on.

[Information supplied follows:]

INSERT FOR THE RECORD									
HOUSE / SENATE	APPROPRIATIONS COMMITTEE		HOUSE / SENATE	ARMED SERVICES COMMITTEE		HOUSE / SENATE	OTHER	Labor & Human Resources & Judiciary	
HEARING DATE	TRANSCRIPT PAGE NO.		LINE NO.		INSERT NO.				
12 March 1982	71		3		71A				

(The information follows:)

There have been numerous studies on the effects of radiation on humans. The most recent comprehensive compilation of these studies is a report issued by the National Academy of Sciences in 1980, BEIR-III. These studies show that the principal effect of radiation exposure is the later induction of cancer which may occur in nearly all the organs and tissues of the human body.

A provision of the proposed act is to require the Secretary of Health and Human Services to publish a list of cancers which have been scientifically demonstrated to be positively correlated with any level of exposure to radiation. Since this list is not available now, we have used information available in the studies discussed above. These studies show that cancers which have shown the strongest association with radiation in these studies include breast cancer in women, thyroid cancer, lung cancer, and leukemia. Only a few cancers, such as prostate cancer and chronic lymphatic leukemia, have not shown an association with radiation exposure. However, the cancers induced by exposure to radiation are clinically indistinguishable from cancers which occur naturally or from other causes. Therefore, when attempting to identify those particular cancers which may have been induced by radiation exposure, one must consider essentially all cancers.

Statistics published by the National Cancer Institute concerning incidence rates of cancer lead one to conclude that in a given U.S. population approximately 25 percent will develop a cancer over their lifetime from natural causes of the type that have been shown to be associated with radiation exposure. Therefore, of the 220,000 participants in the atmospheric nuclear testing program (about half of whom were at the Nevada Test Site), approximately 54,000 individuals would be expected to develop a cancer from natural causes of the type that could be associated with radiation exposure. However, only a very few of these cancers are attributable to radiation exposure resulting from test participation.

In addition to the atmospheric nuclear test participants, there have been approximately 800,000 other civilian and military personnel in the Department of Defense occupationally exposed to radiation over the past three decades. Out of this group, approximately 200,000 cancer cases of concern would be expected due to natural causes.

In the U.S. population, there have been millions of people occupationally exposed to radiation in various occupations, such as medical and dental x-ray technicians, industrial radiographers, nuclear science researchers, airline pilots and flight crews, and workers in the nuclear power industry. No data or report exists to show the precise number of people that have worked in these occupations over the past few decades. However, the Environmental Protection Agency (EPA) has published a report which estimates that in 1975 there were approximately 1.2 million in the U.S.

GENERAL DECLASSIFICATION SCHEDULE STAMP

UNCLASSIFIED

BEST COPY AVAILABLE

INSERT FOR THE RECORD

HOUSE / SENATE	APPROPRIATIONS COMMITTEE	HOUSE / SENATE	ARMED SERVICES COMMITTEE	HOUSE / X SENATE	OTHER: Labor & Human Resources & Judiciary		
HEARING DATE	TRANSCRIPT PAGE NO.	LINE NO.	INSERT NO.				
12 March 1982	71	3	71A				

workforce occupationally exposed to radiation. Of this total, approximately 410,000 received measurable exposure; their collective exposure was about 135,000 person-rem for that year alone. Of the 1.2 million people exposed in 1975, approximately 300,000 individuals would be expected to develop a cancer from natural causes of the type associated with radiation exposure.

DO NOT TYPE BEYOND THE BLUE LINES TOP, BOTTOM, OR SIDES

GENERAL DECLASSIFICATION SCHEDULE STAMP

UNCLASSIFIED

TWO LINES LEFT

BEST COPY AVAILABLE

INSERT FOR THE RECORD									
	HOUSE / SENATE	APPROPRIATIONS COMMITTEE		HOUSE / SENATE	ARMED SERVICES COMMITTEE		HOUSE / SENATE	OTHER	Labor & Human Resources & Judiciary
						x			
HEARING DATE		TRANSCRIPT PAGE NO.	LINE NO.		INSERT NO.				
12 March 1982		71	10		71B				

(The information follows:)

The answer to this question depends on the meaning of the term "significant." There is no agreement within the Government or the scientific community as to what constitutes a significant dose. Occupational exposures within the Department of Defense have been low. For example, the average lifetime radiation exposure of all personnel occupationally exposed, including the atmospheric nuclear test participants, has been about 0.5 rem. Compared to the 15 rem these same personnel will receive on the average over their lifetimes from natural background and medical radiation, it is indeed small.

However, one way to answer the question is to consider the dose which is sufficient to give rise to compensation under the proposed atomic bomb fallout compensation act of 1982. This dose varies as a function of the specific cancer, the specific age at exposure and the specific age at the onset of disease. For example, the dose for 10 percent attributable risk of leukemia for a male exposed at age 20 is 1.2 rads if the leukemia occurs at age 24 and is 4.0 rads if the leukemia occurs at age 50. The dose for 10% attributable risk of liver cancer for a male exposed at age 20 is 0.7 rad if the cancer occurs at age 30 and is 6.0 rads if the cancer occurs at age 50. To put these doses in perspective, they should be compared to non-occupational exposures that all people receive. For example, by age 50, people in the U.S. have received on the average approximately 10 rads from natural background radiation and medical x-rays.

DO NOT TYPE INFORMATION OUTSIDE LINES TOP, BOTTOM, OR SIDES

These examples are applicable to Defense Department personnel since most were males and most, especially nuclear test participants, received their exposure at an early age. It is clear that the 10% attributable risk level results in doses which are very low for these cancers. This occurs primarily because the radiation risk recommended by scientific organizations and the federal government for low level exposure are conservative because they are based on linear extrapolation from high exposures. For other cancers and other on-set periods, the doses will be higher. In general, the dose tends to increase with age because the natural incidence of cancer increases with age.

GENERAL DECLASSIFICATION SCHEDULE STAMP

We have estimated the number of personnel with occupational lifetime doses greater than 0.7 rad since it appears to be the minimum dose which would give rise to compensation under the proposed act. Of the 250,000 atmospheric nuclear test participants, approximately 33,000 have a recorded dose greater than 0.7 rad. Of the other 800,000 Defense Department personnel who have been occupationally exposed to radiation, approximately 100,000 have a recorded dose greater than 0.7 rad. The number of people in the U.S. workforce with lifetime doses greater than 0.7 rad cannot be estimated since such exposure information is not available. However, based on the EPA report, approximately 45,000 workers received greater than 0.7 rad in 1975 alone. I want to emphasize that the Department of Defense does not consider this a significant dose or that these numbers of people were exposed to a significant dose.

UNCLASSIFIED

BEST COPY AVAILABLE

INSERT FOR THE RECORD									
	HOUSE / SENATE	APPROPRIATIONS COMMITTEE		HOUSE / SENATE	ARMED SERVICES COMMITTEE		HOUSE / SENATE	OTHER	Labor & Human Resources & Judiciary
							x		
HEARING DATE		TRANSCRIPT PAGE NO.	LINE NO.		INSERT NO.				
12 March 1982		71	25		71C				

(The information follows:)

Before providing an estimate, which I emphasize is necessarily based upon preliminary work with incomplete data, it should be noted that the bill prescribes a 95% confidence level for the doses to be used in determining eligibility. The extent of variance between the most probable dose and the dose expressed at a 95% confidence level depends upon the extent of detailed, quantitative knowledge available with respect to each element in a given numerical distribution. Such detailed knowledge of the distribution of individual or group radiation doses is unavailable for the U.S. population potentially exposed to radiation from nuclear tests of the U.S., USSR, and other countries. Credible estimates regarding this radiation dose distribution would require detailed knowledge of the individual or group activities and environment, e.g., terrain shielding, whether the individual or group was inside or outside, and location relative to radioactivity. Clearly, such knowledge for that major portion of the U.S. population that was potentially exposed between 1951 and 1962 is unobtainable and would be impractical to manage even if obtained. In the absence of that detailed knowledge, assumptions regarding the dose distribution introduce an imprecision so vast that the 95% confidence level loses any meaning as a statistical value. Consequently, any statement, calculation, or estimation, based on a 95% confidence level for dose and purporting to define the number of compensable U.S. citizens, would be conjecture without validity and dangerously misleading, especially if used out of context. Accordingly, the following estimate is not based on the 95% probability level and may therefore be significantly understated.

In order to arrive at even a preliminary estimate we had to make a number of assumptions regarding age at exposure, age at onset of disease, dose, the distribution of the dose, the distribution of disease incidence, and other factors. Although we attempted to be both realistic and conservative in these assumptions, the estimates may or may not be close to the number of individuals who would actually be eligible if the bill were enacted.

We estimate that there would be anywhere from 75 to 125 compensable cases among the Department of Defense affiliated participants in the atmospheric nuclear testing program. Within Utah, between 300 and 1,000 people could be eligible. The Utah population, however, is not the only group which received offsite exposures which could involve compensation. We know, for example, similar occurrences happened in other areas. Overall, we believe that somewhere between 2,000 and 5,000 people would be eligible for compensation based upon exposure to offsite fallout. If the 95% confidence level for dose were used, the number of people eligible for compensation would be higher.

GENERAL DECLASSIFICATION SCHEDULE STAMP

UNCLASSIFIED

TWO LINES LEFT

BEST COPY AVAILABLE

INSERT FOR THE RECORD									
	HOUSE	APPROPRIATIONS COMMITTEE		HOUSE	ARMED SERVICES COMMITTEE		HOUSE	OTHER	Labor & Human
	SENATE			SENATE		x	SENATE		Resources & Judiciary
HEARING DATE		TRANSCRIPT PAGE NO.	LINE NO.		INSERT NO.				
12 March 1982		71	25		71D				

(The information follows:)

As previously discussed, there have been approximately 800,000 civilian and military personnel in the Department of Defense occupationally exposed to radiation not associated with the atmospheric nuclear testing program. The doses to these personnel are known accurately since they were measured with dosimetry devices. Applying the assumptions used in answering question three, we estimate that there would be approximately 400 compensable cases for exposure through 1981. We have also attempted to estimate the number of compensable cases in the U.S. workforce for people occupationally exposed to radiation. Based upon the 1975 EPA study, we estimate that about 100 compensable cases would result in this segment of the population for each year of exposure comparable to the exposure received in 1975. Thus, without even considering medical diagnostic and therapeutic exposures, the bill could, if extended to other radiation liability cases, compensate several thousand people overall.

The CHAIRMAN. How long will it take you to furnish this data or information? It should not be very long.

General GRIFFITH. We think we could give you a preliminary estimate, sir, in 2 weeks or less.

The CHAIRMAN. That is certainly reasonable.

Do you believe that some benefit of the doubt should be given those people who lived and worked under the shadow of the Nevada atmospheric tests? If so, how should that benefit of the doubt be insured?

Mr. WADE. Yes, I think we believe some benefit of the doubt should be given. I believe the numbers are probably in the ball park. One of the things we are concerned about, Mr. Chairman, is that, as we understand it, the legislation would include not only offsite residents but workers at the Nevada test site. We think quite a distinction can be drawn between the radiation exposure of workers on the Nevada test site and those offsite. It is that sort of uncertainty, we believe, that requires much more study.

The CHAIRMAN. I note that the administration estimates as many as 96 people may have developed cancer as a result of the Nevada fallout.

Let us assume that there are 96 people who have been harmed. Do you really expect that these 96 people would be able to win their claims under the current Federal Tort Claims Act? The administration does not seem to want us to address this problem through legislation at this time. Do you people prefer that the courts take it upon themselves to broaden the meaning of the law so that these people can win their claims?

I have practiced a lot of law. I have tried a lot of cases. I have tried a lot in Federal court. New law can be made in this area that will go far beyond what this legislation would do. Are you willing to take those risks?

First of all, do you think they can really win under the present Federal Tort Claims Act, these 96 cases or any percentage of them, under present law without an expansion?

Mr. WADE. Without conceding the issue of negligence, I believe there may be a few that can establish causation under this methodology.

The CHAIRMAN. How about you, General?

General GRIFFITH. Sir, if they have a meritorious case, certainly we feel that they should be compensated.

The CHAIRMAN. You know if the court reverses the burden of proof, or on its own lessens the standard of proof—I am thinking in terms of section 402(a) of the restatement of torts where strict liability becomes a pretty easy method of gaining damages—is the administration prepared to pay billions of dollars here? That may be what is going to happen because of the short-sightedness of facing this problem now.

General GRIFFITH. Clearly I think the administration is concerned about the economic impact of any legislation.

The CHAIRMAN. Then one of the problems I have with the administration and with your testimony is that almost everything you have said so far is supportive of the bill, except you do not want to go ahead at this particular point.

Yet at the same time the administration has not come right out and said it wants to justly compensate these people who have clearly suffered even on an attributable risk basis with a limitation on liability, both of which are somewhat new concepts in law but nevertheless easily understood. It bothers me a little bit.

Let me just ask one more question. I am sorry, Senator Grassley, to take so long here.

It is my clear impression that our defense nuclear program is suffering from a credibility problem. People have told me that as a result of their treatment during the Nevada atmospheric tests, they do not trust the military's claims about the safety of the MX missile program for neighboring civilians. We went through that in Utah. I have to admit there is a great deal of mistrust of what the military calculates and says. Yet Utah is probably as promilitary as any State in the Union.

We should all keep in mind that the downwind citizens in my State welcomed the atmospheric testing in the 1960's and did so on patriotic grounds. We even had people testify out there that if they had to do it over again they would do it over again if it was important to our country's needs and defense. I do not know that you are going to find people like that everywhere.

In the 1980's, however, we are reluctant to accept the MX missile. Part of that reluctance is because there is a great deal of mistrust of the military that has developed. Part of that has come, it seems to me, because of our inability to address this problem among others.

Do you not feel that if it is essential to our defense program and I think to the nuclear industry as well that the Government insure a proper legal recourse for the persons who may have been harmed by the Nevada tests so that fairness is guaranteed and faith in the American Government is restored?

It seems to me that that is a tough question for you to answer any other way but that you do agree.

Mr. WADE. We certainly agree. It is a common goal of our Department and your committees, Mr. Chairman, to compensate

those people who may have been injured by fallout. The only thing we disagree on at the moment is the formula and the time.

I think if we are given another year or so we can finish the work that is going on in Nevada and will have a much better basis for approaching this problem.

The CHAIRMAN. However, no better method than what we have right here in this bill as you indicated earlier. You might be able to arrive at more specific figures as to who suffered and who did not, but could you come up with a better method than what we have in this bill which you seem to endorse here today?

Mr. WADE. At the moment we think the concept of probability of causation is certainly the best tool we have had.

The CHAIRMAN. General?

General GRIFFITH. I think so, sir. Of course, dose assessment is still one of the most significant variables under the proposed legislation. As Mr. Wade said earlier, there are some studies still underway which when they are completed will give us better insight.

The CHAIRMAN. How about my prior question? Do you not think it would restore credibility to a great degree if we face up to this problem and did what was right and just for the people who have probably suffered as a result of this? I am using probably as a legal term because there are people who have suffered and we know it and you know it.

General GRIFFITH. Yes, sir, I think the Department of Defense has always taken the position that those who have been damaged should be compensated. As Mr. Wade said, I think it is a matter of agreeing on the details and getting on with it.

The CHAIRMAN. Thank you. I appreciate both of you being here today. I can see that you may be a little bit puzzled yourselves as to where are we going on this thing as far as the administration is concerned.

We think we have come a long way to accommodate the administration and the Government while at the same time doing what is right here. We hope that you can come up and support this bill in a much shorter period of time than a couple of years, or help us to make it better.

We have no pride of authorship. If we can make it better, we will be delighted to do so as long as it does not take away the rights of individual citizens.

Senator Grassley?

Senator GRASSLEY. Thank you, Mr. Chairman.

Mr. Wade, my first question to you is whether or not your department's or your agency's initial position on this legislation changed after you had submitted that position to the Office of Management and Budget?

Mr. WADE. Some nuances. There were some differences in how my Department worded its testimony, and some suggestions made by OMB. There was no basic difference in the philosophy.

Senator GRASSLEY. When you used the word nuances, were you referring to style and approach to the subject as opposed to any basic philosophy or any basic legislative remedy?

Mr. WADE. Yes; again, all I could argue is semantics, Senator Grassley. We have never altered our opinion that if compensation

is due it should be provided. We are not sure that a legislative remedy is the proper remedy. We believe a remedy is necessary.

Senator GRASSLEY. How about you, General Griffith, and the Department of Defense?

General GRIFFITH. Sir, I think the thrust of our testimony was not changed. I think there was wordsmithing, but our concerns stem from the fact that we have always taken the position that those who have been damaged should be compensated. We are deeply concerned about the economic impacts, but in our business even more so on the impact on the whole nuclear radiation and R. & D. establishment. We think we have to be very careful that we do not do some things here that are going to impact Federal standards and cause great turbulence in things like medical and dental technicians and nuclear power programs and the weapons program and the R. & D. establishment, and so on.

Senator GRASSLEY. Before I ask my next question, I would just say that the hardest demonstration that the plaintiff will have to make is the level of his exposure to radiation from the Nevada tests. Most of the relevant data is obviously controlled by the Federal Government. The Department of Energy will be charged with developing a descriptive bibliography of data and of reports.

How long will that take and has there been any start at compiling it?

Mr. WADE. There have been two efforts that address your question, Senator Grassley. If I may, I would like to defer to Mr. Bruce Church, who is responsible for both of them.

Mr. CHURCH. Senator, when we began the offsite dose reassessment project several years ago, a fundamental task was to gather all of the important documents and papers relative to the offsite exposures and put them in a collection in Las Vegas, a collection that we now refer to as the coordination information center.

That center was open to the public last July and made these documents and papers available to all those who chose to use it. We maintain a current bibliography on the Oak Ridge RECON system. All those who have access to the RECON system have access to that bibliography.

We feel we have basically satisfied what the bill suggests in the way of producing a bibliography. The current bibliography is a very large one. It is something like 7 to 10 inches thick. We feel if people need assistance in dealing with the mass of data and paperwork involved that the use of the information center or the RECON system is the most appropriate way to access that data.

Senator GRASSLEY. Is there any classified material involved?

Mr. CHURCH. No, there is not. In fact, let me elaborate on that a little. We have had a very aggressive program working to declassify any and all information that can be declassified and placing it in the center.

Senator GRASSLEY. On another point, what is the exact current status of DOE's and DOD's project to re-estimate dose levels?

Mr. WADE. I will let Mr. Church answer.

Mr. CHURCH. Senator, please restate your question if you would.

Senator GRASSLEY. What is the exact current status of DOE's and DOD's project to re-estimate dose levels?

Mr. CHURCH. About 2 years ago we began a two-goal program. I mentioned the one goal a moment ago. Our second goal was to look at the dose reconstruction of the offsite public. We have made considerable and good progress in my opinion. Some of that was alluded to in Mr. Jablon's testimony. We hope to achieve, by the end of this fiscal year, a review of what we call the population dose or the average dose and be well on our way to establishing the machinery to develop the individual dose for a given individual coming to us from the community whereby he can give us the kind of information we need with respect to life style—specifically where he was, given dates, and so on.

It is very critical to a dose reconstruction, given a particular event and the fallout resulting from that event, to know the location of the individual. This type of modeling and machinery we hope will be well on its way by the end of this year. We feel that by the conclusion of fiscal year 1983 it will be completed and the final phase of our project, which will be extending the dose reconstruction to people beyond the present fallout patterns, will begin.

Our current target is to complete the program sometimes in the beginning of fiscal year 1984.

Senator GRASSLEY. That is all I have, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Grassley.

Gentlemen, we appreciate your coming and we appreciate the candor of your remarks here today. Thank you.

Our third and final panel represents the Department of Health and Human Services and the Veterans' Administration. I would like to welcome Dr. Edward Brandt, Assistant Secretary for Health and Human Services, and Mr. John H. Thompson, the Deputy Assistant, General Counsel, of the Veterans' Administration.

I would like to also welcome other representatives of these departments here today who are with them.

Dr. Brandt, we will begin with your testimony.

STATEMENT OF DR. EDWARD N. BRANDT, JR., ASSISTANT SECRETARY, HEALTH AND HUMAN SERVICES ADMINISTRATION; ACCOMPANIED BY GILBERT W. BEEBE, PH. D., EPIDEMIOLOGIST, NIH-NCI

Dr. BRANDT. Thank you very much, Mr. Chairman.

Let me introduce on my left Dr. Gilbert Beebe who is an epidemiologist with the National Cancer Institute with long experience in dealing with radiation issues.

I am pleased to appear before you today to discuss scientific issues related to the proposed bill, the Atomic Bomb Fallout Compensation Act of 1982. Other agencies are addressing the compensation issues, and I will focus my remarks on the scientific aspects of the bill.

First, let me focus on what we know about the carcinogenic effects of low level ionizing radiation, some factors that modify that risk, and the implication for patients whose cancer may be associated with radiation exposure, and then discuss the relationship of this scientific background to the concepts of the bill.

Scientists have calculated that an average person living in the United States is exposed to about one-tenth of a rem of radiation a

year from natural sources including cosmic rays, radioactive elements of the earth's crust, and radioactive isotopes that occur naturally in the body. The average person receives another one-tenth of a rem from particular manmade sources, chiefly medical diagnostic tests.

Additionally, smaller sources of exposure include consumer products such as television sets and smoke detectors, crushed rock and building materials, phosphate fertilizers, leakage from nuclear reactors, and fallout from nuclear weapons.

Radiation can also be absorbed from food. For example, iodine-131 from radioactive fallout in milk is rapidly taken up by the thyroid gland.

In general, a person will receive approximately 14 rem from these natural sources during a lifetime. It is generally believed that no matter how small, any dose may have effects, and as the dose of radiation increases, the risk of cancer increases.

We cannot be certain of the influence of variables other than radiation. Age and exposure and sex have been shown to affect the risk per unit of radiation. Leukemia; for example, has been more frequent among Japanese atomic bomb survivors exposed early or late in life than among those survivors exposed in middle age. The risk of breast cancer per rem appears to be highest for women exposed in their teens and lowest for those exposed after about age 40.

While adjustments have been made for age and sex, other biological factors such as immune confidence, hormonal status, and genetic composition may also influence the risk per rem for a given cancer. Personal habits such as smoking, which greatly increases a person's risk of lung and other cancer, may interact with radiation to produce a total risk higher than the sum of their separate risks.

Occupational carcinogens such as arsenic and asbestos also may interact with ionizing radiation to increase a person's risk for lung cancer. More research on these factors is needed to reduce this gap in our knowledge.

In summary, Mr. Chairman, we know which tissues are sensitive to radiation in terms of cancer. We have risk coefficients for these and adjustments for age and sex from the new biological effects of ionizing radiation report.

Although there are still some factors we cannot account for, we are able to establish rough estimates of risk for some cancers.

Because areas in the United States vary in their cancer rates, we should use local statistics rather than national rates to estimate the probability that a person's cancer was due to radiation exposure. In Utah, the incidence and the mortality rates were below the national average. With present data we can estimate roughly the probability that a person's cancer might be due to exposure to radiation from the atomic bomb testing program that occurred in Utah between 1951 and 1961.

Let me give two examples: lung cancer and thyroid cancer. The likelihood that lung cancer appearing in a 60-year-old man being due to an exposure of 10 rem of radiation during the nuclear testing program when he was age 40 would be on the order of 2 or 3 percent. The lung is only moderately sensitive to the carcinogenic

effects of radiation and the 10 rem dose would be unlikely to have an effect.

On the other hand, thyroid cancer appearing in a 30-year-old female following exposure of 10 rem at age 10 would have a probability on the order of 30 to 35 percent. The thyroid is particularly sensitive to carcinogenic effects of ionizing radiation.

In addition to whatever small dose might be received directly through the atmosphere, a main dose to the thyroid gland would have occurred through the food chain, especially with ingestion of iodine-131 in milk. Thyroid cancer is relatively rare. So despite the lack of a marker it would in some instances not be unreasonable to assume that a thyroid cancer was radiation related.

Cancer is not a single disease but a collection of diseases with highly variable implications for public health and for the affected individual. I would like to submit for the record a table which compares some different forms of cancer with regard to their sensitivity to radiation, their relative frequency among cancers in the United States white population, and their influence on survival.

As for leukemia, one of the forms of cancer most frequently associated with radiation exposure, it also is not a single disease and its different forms vary in radiation sensitivity, in relative frequency, and in prognosis.

For example, chronic lymphocytic leukemia, a form that occurs mostly in the aged and has a better prognosis than other forms, has never been associated with radiation. Those forms of leukemia that have been associated with radiation are unusual in that they begin occurring sooner after exposure than other cancers and the excess disappears after 25 to 30 years.

Let me now discuss the specifics of the bill in light of the concepts that I have just presented.

The bill does not distinguish between different types of cancers. The consequences in terms of longevity, medical expenses, loss of earnings, and other factors are significantly different for different types of cancers.

For example, two of the most commonly expected radiogenic malignancies are thyroid cancer and leukemia. Thyroid cancer can usually be successfully treated without any diminution in life expectancy, whereas leukemia is often fatal.

The determination of exposure levels presents certain problems. The lack of reliable documentation of exposure to low-level radiation due to fallout from atomic weapon tests would make it difficult to make precise determinations of what exposure had occurred.

The bill would require the Secretary of Health and Human Services within 60 days of enactment to publish a list of radiation-related cancers and then, within 6 months, to devise and publish radioepidemiological tables that estimate the likelihood that various categories of persons who have or have had radiation related cancers and who have received specific levels of exposure prior to the onset of their disease developed cancer as a result of those exposures.

We believe that the proposed time limits are not sufficient. Development of the list and the tables would require considerable de-

liberation which could not be accomplished in the time periods allowed.

The limitations in the attributable risk tables must also be noted. Provision of incremental damages on the basis of 1 percent differences in attributable risk may be giving too much weight to figures whose precision does not reach that degree of certainty.

As I have observed, there are some aspects of the concept behind the bill that require further consideration. We in the Public Health Service are ready to work with your committees on refinements of that concept.

Thank you very much, Mr. Chairman. I will be happy to respond to questions.

[The prepared statement of Dr. Brandt follows:]

STATEMENT OF EDWARD N. BRANDT, JR., M.D., ASSISTANT SECRETARY FOR HEALTH, DEPARTMENT OF HEALTH AND HUMAN SERVICES

Mr. Chairman and Members:

I am pleased to appear before you today to discuss scientific issues related to the proposed draft bill, the Atomic Bomb Fallout Compensation Act of 1982. Other agencies are addressing the compensation issues, and I will focus my remarks on the scientific aspects of the bill.

First I would like to focus on what we know about the carcinogenic effects of low-level ionizing radiation, some factors that modify the risk, and the implication for patients whose cancer may be associated with radiation exposure, and then discuss the relationship of this scientific background to the concepts in the bill.

Ionizing radiation is generated by short wave length, high frequency sources (X-rays and gamma rays) as well as by particles (electrons, protons, neutrons and alpha particles). Its effects on people are expressed in terms of rad--a given amount of energy absorbed per unit of tissue--and rem--a measure which takes into account the different biological effects of different kinds of radiation. Rem is the unit commonly used in radiation protection work.

Scientists have calculated that an average person living in

the United States is exposed to about one-tenth of a rem of radiation a year from natural sources--cosmic rays, radioactive elements of the earth's crust and radioactive isotopes that occur naturally in the body. The average person receives another one-tenth of a rem from particular man-made sources, chiefly medical diagnostic tests. Additonal, usually smaller sources of exposure include consumer products such as television sets and smoke detectors, crushed rock and building materials, phosphate fertilizers, leakage from nuclear reactors and fallout from nuclear weapons. Radiation can also be absorbed from food, for example, iodine-131 from radioactive fallout in milk is rapidly taken up the thyroid gland. On the average a person receives approximately 14 rem from these sources during a lifetime.

It is generally believed that no matter how small, any dose may have effects, and that as the dose of radiation increases, the risk of cancer increases. Estimating the risks of radiation exposure has been of great concern to those setting standards for the protection of populations against radiation injury. Efforts to determine risks have been carried out continuously by various national and international boards of experts during the last 25 years. The field is still an

uncertain one, but I will attempt to put in perspective the knowledge we now have.

The two most recent comprehensive and detailed expert reports are from the National Academy of Sciences Advisory Committee on the Biological Effects of Ionizing Radiation--the BEIR Report of 1972 and its 1980 update--and the United Nations Scientific Committee on the Effects of Atomic Radiation--the UNSCEAR Report of 1977. Both reports assess in detail the health risks of low-level radiation. The assessments are based on observations of exposed people, and on research in laboratory animals. The two reports describe the risks of cancer in exposed individuals.

The risk estimates for cancer in populations exposed to wholebody radiation, as stated in both reports, imply that exposure to natural background radiation could account for about one percent of the total natural cancer incidence. But cancers that occur in populations exposed to more than background radiation differ. Cancers most often seen in these populations include leukemia, breast cancer, and thyroid cancer. It is important to note that cancer is a delayed effect of radiation. Excess cases begin to appear only after

some years, perhaps 2 to 4 years for leukemia, and 10 years for cancers of organs such as the lung, thyroid and breast.

Both reports note that these estimates are based on data derived from epidemiologic studies of irradiated human populations. The interpretation of these data is complicated by several factors. One of the most important factors is that the data on which risk estimates are based come primarily from observations of the atomic bomb survivors in Japan and certain medically-irradiated patients who received relatively high doses at high dose rates of exposure. It is not known whether the same proportional relationship between the radiation dose and the incidence of cancer at high dose levels applies also at low dose levels. Another factor is that the estimates of low-level risk also may fail to allow for the capability of the body to repair radiation injury at low doses and low dose rates. There is, furthermore, usually some uncertainty about the doses of radiation actually received by the individuals under observation. In addition, data on the frequency of cancer incidence in irradiated populations cannot always be considered complete, because some of the populations under observation are continuing to develop new cases of cancer as the years pass. This is particularly a concern when one is examining a commonly occurring cancer, such as breast or lung cancer.

Finally, scientists cannot be certain of the influence of variables other than radiation. Age at exposure, especially, and also sex have been shown to affect the risk per unit of radiation. Leukemia, for example, has been more frequent among Japanese atomic bomb survivors exposed early or late in life than among survivors exposed in middle life. And the risk of breast cancer per rem appears to be highest for women exposed in their teens and lowest for those exposed after about age 40. The 1980 followup of the BEIR Report adjusts for the two variables giving both age- and sex-specific risk coefficients for the more common forms of cancer associated with excess radiation exposure.

While adjustments have been made for age and sex, other biologic factors such as immune competence, hormonal status, and genetic composition may also influence the risk per rem for a given cancer. Also personal habits such as smoking, which greatly increase a person's risk of lung and other cancers, may interact with radiation to produce a total risk higher than the sum of their separate risks. Occupational carcinogens such as arsenic and asbestos also may interact with ionizing radiation to increase a person's risk for lung cancer. More research on these factors is needed to reduce this gap in our knowledge.

In summary, Mr. Chairman, we know which tissues are sensitive to radiation in terms of cancer, we have risk coefficients for these and adjustments for age and sex from the new BEIR report. Although there are still some factors we cannot account for, we are able to establish rough estimates of risk for some cancers.

Because areas in the United States vary in their cancer rates, we should use local statistics rather than national rates to estimate the probability that a person's cancer was due to radiation exposure. For example, in Utah the incidence and mortality rates are below the national average. With present data--BEIR risk coefficients and the local cancer rates of Utah--we can estimate roughly the probability that a person's cancer might be due to exposure to radiation from the atomic bomb testing program that occurred in that State between 1951 and 1961. I will give two examples, lung cancer and thyroid cancer.

The likelihood that a lung cancer appearing in a 60 year old man was due to an exposure of 10 rem of radiation during the nuclear testing program when he was age 40 would be on the order of 2 or 3 percent. The reasons are as follows: the lung is only moderately sensitive to the carcinogenic effects of radiation and the 10-rem dose would be unlikely to have an

effect. Lung cancer, although relatively low in Utah, is a common form of cancer. It would be difficult to attribute a case of lung cancer to radiation exposure. At present, a cancer carries no marker by which its cause can be determined.

On the other hand, thyroid cancer appearing in a 30-year old female following an exposure of 10 rem at age 10 would have a probability on the order of 30 to 35 percent. The thyroid is particularly sensitive to the carcinogenic effects of ionizing radiation. In addition to whatever small dose might be received directly through the atmosphere, the main dose to the thyroid gland would have occurred through the food chain, specifically with ingestion of iodine-131 present in milk. Thyroid cancer is relatively rare, so despite the lack of a marker, it would in some instances not be unreasonable to assume that a thyroid cancer were radiation-related.

Cancer is not a single disease but a collection of diseases with highly variable implications for public health and for the affected individual. Cancers associated with exposure to radiation in particular are markedly non-uniform with respect to their influence on mortality, morbidity, and quality of life. I would like to submit for the record a table that compares some different forms of cancer with regard to their

sensitivity to radiation, their relative frequency among cancers in the U.S. white population, and their influence on survival.

I would like to say a few words about leukemia, one of the forms of cancer most frequently associated with radiation exposure. It also is not a single disease and its different forms vary in radiation sensitivity, in relative frequency (especially in relation to age), and in prognosis. For example, chronic lymphocytic leukemia, a form that occurs mostly in the aged and has a better prognosis than other forms, has never been associated with radiation. Those forms of leukemia that have been associated with radiation are unusual in that they begin occurring sooner after exposure than other cancers (at 2 to 4 years). The excess disappears after 25 to 30 years.

Now I would like to discuss the specifics of the bill in light of the concepts I have just mentioned.

The bill does not distinguish between different types of cancers. The consequences, in terms of longevity, medical expenses, loss of earnings, and other factors are significantly

different for different types of cancer. For example, two of the most commonly expected radiogenic cancers are thyroid cancer and leukemia. Thyroid cancer can usually be successfully treated without any diminution in life expectancy, whereas leukemia is often fatal.

As I have already mentioned, the determination of exposure levels presents certain problems. The lack of reliable documentation of exposure to low-level radiation due to fallout from atomic weapon tests -- particularly exposure through the food chain -- would make it difficult to make precise determinations of what exposure had occurred.

The bill would require the Secretary of Health and Human Services, within sixty days of enactment, to publish a list of radiation-related cancers, and then, within six months, to devise and publish radio-epidemiogical tables that estimate the likelihood that various categories of persons who have or have had radiation-related cancers, and who have received specific levels of exposure prior to the onset of their disease, developed cancer as a result of those exposures. We believe that the proposed time limits are not sufficient. Development of the list and the tables would require considerable

deliberation which could not be accomplished in the time periods allowed.

The limitations in the attributable risk tables also must be noted. Provision of incremental damages on the basis of one-percent differences in attributable risk may be giving too much weight to figures whose precision does not reach that degree of certainty.

As I have observed, there are some aspects of the concept behind the bill that require further consideration. We are ready to work with your committees on refinements of the concept.

Thank you for the opportunity to testify. I will be happy to answer any questions.

Table 1

Selected Types of Cancer and Their Relative Sensitivity to the Carcinogenic Action of Radiation, Relative Frequency Among All Cancers, and 5-Year Relative Survival Rates, U. S. White Population, All Ages

Type of Cancer	Radiosensitivity	Percent Among cancers	5-Year Survival rates
Colon and rectum	Low	15%	46%
Lung	Moderate	14	10
Breast	Very high	14 (a)	65
Prostate	Absent (?)	8.2 (b)	57
Thyroid	Very high	1.2	85
Leukemia	Very high (c)	3.0	14

(a) For women only, 28 percent.
(b) For men only, 17 percent.
(c) Except chronic lymphocytic leukemia.

Sources: Radiosensitivity evaluation from NAS BEIR III, pp. 266-267.

Relative frequency from NCI Surveillance Epidemiology and End Results (SEER) Program 1973-1977, Table 5.

Relative survival from SEER, 1976, Report 5, based on 1965-1969 diagnoses.

The CHAIRMAN. Thank you, Dr. Brandt.
Mr. Thompson?

STATEMENT OF JOHN H. THOMPSON, DEPUTY ASSISTANT GENERAL COUNSEL, VETERANS' ADMINISTRATION, ACCOMPANIED BY JAMES J. SMITH, M.D., DIRECTOR, NUCLEAR MEDICINE, VETERANS' ADMINISTRATION, AND RALPH IBSON, DEPUTY ASSISTANT GENERAL COUNSEL, VETERANS' ADMINISTRATION

Mr. THOMPSON. Thank you, Mr. Chairman.

I am Jack Thompson, one of the Deputy Assistant General Counsels. I am joined today by two of my colleagues to help in answering your questions: Dr. James Smith, who directs our Nuclear Medicine Service and Mr. Ralph Ibson, one of my colleagues in General Counsel.

If our complete statement will be entered for the record I believe I can summarize very quickly the issues and concerns that bring us here today.

The draft substitute language is broad enough to include under the new remedies individuals whose exposure occurred while in the military service. We at VA think that is not a good idea and we would like to address that aspect of the bill.

As pointed out by Senator Grassley, the VA administers multibillion dollar compensation and health care systems to benefit veterans whose injuries or diseases may be traced to military service.

As detailed in our prepared statement, veterans with service-related cancers can draw $1,100 or more per month in compensation. Furthermore, our health care authority was recently expanded to virtually assure eligibility for care to any exposed test participant who now suffers from cancer.

Because these programs are in place and function well, we think an additional remedy for veterans is unnecessary. Furthermore, we believe it is inequitable to carve out this narrow exception to the general rule of law that precludes suit for service-related injuries.

Some 2.3 million veterans now draw compensation for service-connected disabilities, yet only a relative few could take advantage of this new remedy.

We also would be very pleased to entertain your questions.

[The prepared statement of Mr. Thompson follows:]

STATEMENT OF

JOHN H. THOMPSON

DEPUTY ASSISTANT GENERAL COUNSEL

OF THE

VETERANS ADMINISTRATION

BEFORE THE

SUBCOMMITTEE ON AGENCY ADMINISTRATION

COMMITTEE ON THE JUDICIARY,

AND THE

COMMITTEE ON LABOR AND HUMAN RESOURCES

UNITED STATES SENATE

MARCH 12, 1982

Messrs. Chairmen and Members of the Committees:

I am pleased to appear before you today to discuss a proposed draft of legislation to provide a new remedy for individuals who develop or have developed certain cancers that may be the result of exposure to ionizing radiation generated by atmospheric testing of nuclear weapons at the Nevada Test Site.

I will defer to the other Administration witnesses on the technical feasibility of the proposal and their conclusions as to whether the actual operation of the proposed compensation system would effectuate the apparent intentions of its drafters.

I will confine my testimony to a discussion of those substantive features of the proposal that make it impossible for the Veterans Administration to favor its introduction or passage. These are:

(1) the inclusion of veterans or military participants within the scope of the bill in derogation of the Feres doctrine; (2) the double liability that would be imposed on the Government for compensation under the proposed bill and statutes relating to compensation of and medical care for veterans; (3) the limitation of the compensation scheme to participants or residents affected by domestic atmospheric tests: and (4) the precedent that would be established for compensating individuals exposed to other environmental hazards.

The principal reason for our concern about this type of legislation is that two of the Veterans Administration's most important missions are to compensate and provide health care to veterans with service-connected disabilities, including radiation-induced disabilities. Among veterans exposed to ionizing radiation during their military service are those who were on-site during atmospheric testing of atomic weapons between 1945 and 1962. The Department of Defense advises that military participants in the nuclear test program numbered some 200,000. Since the proposed bill broadly defines a potentially qualifying "individual" as

anyone who was a resident in the United States or its territories during the period of atmospheric testing at the Nevada Test Site, all of the military participants of those test programs, or their survivors, would be included within the coverage of the legislation.

Under the doctrine of Feres v. United States, 340 U.S. 135 (1950), tortious injuries sustained by members of the Armed Forces incident to active service have been held to be excluded from the grant of jurisdiction under the Federal Tort Claims Act (FTCA), 28 U.S.C. §§ 1346(b), 2671-2680. The rationale for this exclusion, as reaffirmed by the Supreme Court in Stencel Aero Engineering Corp. v. United States, 431 U.S. 666 (1977), is threefold: the distinctively Federal relationship between the Government and members of its Armed Forces makes recovery for in-service injuries founded upon state law inappropriate; the comprehensive compensation scheme for in-service injuries, regardless of fault or negligence on the part of the Government, contained in the Veterans Benefits Act makes additional tort recovery against the Government unnecessary; and the deleterious effect on military effectiveness and discipline that would result from permitting litigation challenging orders or acts occurring during the course of military duty.

Suits for claimed injury resulting from exposure to ionizing radiation while in service have been rejected under the Feres doctrine. For example, in Broudy v. United States, 661 F.2d 125 (9th Cir. 1981), the widow of a veteran who was exposed to ionizing radiation at two atmospheric tests and who subsequently died of lymphoma, filed an administrative claim under the FTCA alleging his wrongful death. The claim was administratively denied and suit was filed. The Ninth Circuit, relying on the Feres doctrine, dismissed that portion of the suit seeking recovery for negligent exposure to radiation incident to service.

The bill as drafted would provide an alternative remedy to the FTCA and would essentially eliminate application of the Feres doctrine in the cases of military participants at detonations at the Nevada Test Site. The manner in which the bill is drafted would address at least one and possibly two of the justifications for Feres. That is, by substituting a pre-emptive Federal system of compensation for injuries resulting from radiation exposure for the various state laws that are the reference points in the FTCA, the concern about disparate recoveries under state laws would be obviated. Additionally, because it appears to be the intention that litigation under any such legislation be directed

at establishing the level of exposure and not the negligence or culpability of the Government, judicial inquiry into military decisionmaking and the special relationship between the Armed Services and their personnel should not be necessary. On the other hand, and especially because the draft contains virtually no procedural provisions, it is possible that plaintiffs may attempt to compel attendance of military officials or burden them with discovery requests not germane to the issue of level of exposure. To the extent that such procedures would result in scrutiny of military decisionmaking and its attendant inhibitory effect on the exercise of military discretion, this rationale of Feres would still be applicable.

The final element of Feres, and one that remains compelling to us, is the existence of a compensation and medical care system already in place to serve as the exclusive Federal remedy for injuries incident to service. We cannot conceive of any justification for undermining the exclusivity of this remedy, as would occur under the proposed draft.

Congress has historically and fittingly provided monetary benefits for those who sustained disability or gave their lives as the result of service to their country. Where a veteran is afflicted with total disability that has been administratively adjudicated to be service-connected, the

under this provision is on the same high priority as treatment for former prisoners of war. The guidelines required to be promulgated under the Act were published for public comment at 46 Fed. Reg. 58,636 (Dec. 2, 1981).

Implicit in the proposal being discussed today is the premise that the programs I have just outlined are insufficient in some unspecified manner to compensate fully those veterans who have sustained disabilities due to their exposure to ionizing radiation while in service. I simply cannot agree with that premise. I believe that inclusion of veterans in this proposal would be an unnecessary and potentially costly duplication of benefits, and that the longstanding underpinning of Feres that veterans benefits should be the exclusive remedy for disability incurred incident to service continues to be valid. This is especially so now that eligibility for priority medical care exists for the purpose of treating even non-service-connected cancers suffered by veterans who were test participants.

If Congress were to determine that this is an appropriate subject for legislation to provide an additional remedy to veterans, as well as other individuals who are covered by benefit programs such as state-administered workers' compensation and its Federal equivalent under the Federal Employees Compensation Act (FECA), a question remains whether it would be justifiable to limit such a

current rate of payment (specified at 38 U.S.C. §§ 314, 331) is at least $1,130 monthly, and can be substantially higher depending on whether the disability is extremely incapacitating and whether the veteran has dependents. Surviving spouses of those veterans whose deaths occurred after a prescribed period of service-connected, total disability or whose deaths were service-connected are entitled to a monthly stipend determined according to the veteran's rank in service and the number of dependents. 38 U.S.C. §§ 410, 411. An adjudication of "service connection" entitles a veteran to education benefits designed for vocational rehabilitation under chapter 31 of title 38, United States Code. Certain dependents of veterans with service-connected, total disabilities or survivors of veterans whose deaths were service-connected are themselves eligible for education benefits under chapter 35 of that title. In addition to the monetary benefits just described, a veteran is entitled to priority medical treatment for service-connected disabilities at the extensive Veterans Administration medical care system. 38 U.S.C. §§ 610, 612(1). Certain surviving spouses and dependants, described above, are also eligible for reimbursement of health care expenses through the Civilian Health and Medical Program of the Veterans Administration (CHAMPVA). 38 U.S.C. § 613.

The statutory and regulatory framework of the disability compensation program is such that any disease may be considered service connected, regardless of when it was first manifested or diagnosed, so long as there is evidence to establish that it was incurred coincident with service. See, 38 U.S.C. § 310; 38 C.F.R. § 3.303(d). Statutory presumptions exist which allow VA to recognize service connection for certain specific diseases, including malignancies, if manifest within a one-year period following discharge from service. 38 U.S.C. § 312. These presumptions do not, however, prevent the awarding of benefits for disabilities with "latent periods" extending beyond the statutorily prescribed presumptive period if sound medical judgment indicates they are indeed service connected. 38 U.S.C. § 313.

The medical uncertainties about the effects of low doses of radiation can make the determination of service-incurrence difficult. However, the standard used by the Veterans Administration is that "reasonable doubt" will be resolved in the claimant's favor in the adjudication of disability claims. This standard comes into play when a "probability as distinguished from pure speculation or remote possibility" arises that a claim is meritorious. 38 C.F.R. § 3.102. During the consideration of claims for service connection for disabilities alleged to have resulted from exposure to ionizing radiation, medical opinion from the

Chief Medical Director of the Veterans Administration, the Armed Forces Institute of Pathology or an independent medical expert from a medical school, university or clinic may be obtained. This ensures that the best available scientific knowledge is used in these deliberations.

In recognition of the fact that medical science is unable to provide either definitive or complete data concerning effects of exposure to ionizing radiation at low doses, Congress acted last session to assure that veterans exposed to such radiation would have access to health care through the Veterans Administration regardless of whether the disability has been adjudicated to be service-connected. In Pub. L. No. 97-72, Congress authorized the Veterans Administration to treat any veteran, exposed to ionizing radiation during atmospheric testing or the post-war occupation of Japan, for any disability except those which the treating physician determines to be due to causes other than exposure. The statute authorizes the Veterans Administration to furnish "hospital care or nursing home care under 38 U.S.C. § 610(a)(5) as well as outpatient care under 38 U.S.C. § 612(f) for any [such] disability notwithstanding that there is insufficient medical evidence to conclude that such disability may be associated with such exposure [to ionizing radiation from the detonation of a nuclear device or the occupation of Hiroshima or Nagasaki]." Treatment

remedy to only those persons who were affected by the atmospheric testing at the Nevada Test Site. As I mentioned earlier, the Department of Defense has estimated that approximately 200,000 military participants were involved in the nuclear test program between 1945 and 1962. Exclusion of the military participants who were present at detonations in other locations could surely form the basis for a challenge to the validity of the legislation under the fifth amendment due process clause. Although perhaps not as vulnerable to constitutional attack on these grounds, the proposal's exclusion of the countless other veterans who have been exposed to low-level ionizing radiation from sources such as diagnostic x-rays, nuclear fuel, and even natural backgrounds is also subject to criticism on the grounds of fairness.

Finally, I believe that serious deliberation is warranted as to whether this type of proposal, if enacted, would create an untenable precedent for compensating individuals who have been exposed to other environmental hazards. I am sure you are aware of the controversies involving health effects from exposure to a number of different hazards ranging from asbestos to toxic waste to dioxins. The tort recovery remedy for disabilities alleged to have resulted from such exposure can be just as problematic in those cases as it has proved to be in cases involving radiation exposure.

The real issue becomes whether the appropriate legislative response to this type of situation is to create new compensation schemes in lieu of existing and well-functioning ones. If Congress perceives inadequacies in existing programs, a preferable alternative may be to modify or fine-tune those programs. I can assure you that the Committees on Veterans' Affairs in both the Senate and the House have taken very seriously their oversight responsibilities with respect to these very issues.

Messrs. Chairmen, for all of the foregoing reasons the Veterans Administration opposes extension of the proposed new remedy to individuals whose exposure to ionizing radiation occurred during their service in the armed forces.

That concludes my prepared statement. I will be happy to answer any questions the Chairmen or other members of the Committees might have.

The CHAIRMAN. Thank you.

Dr. Brandt, what do you personally think of the use of radioepidemiology and attributable risk as a basis for awarding damages to cancer victims who have been exposed to radiation?

Dr. BRANDT. Mr. Chairman, on scientific grounds that is the best way we have to determine probability of a particular patient's cancer being due to radiation. Since that is the best that we have, I think that is what we have to use.

The CHAIRMAN. Basically medically you are endorsing the approach we are using in this bill.

Dr. BRANDT. I am endorsing it on the basis that it is the best we have.

The CHAIRMAN. Do you believe it is possible for the Department of Health and Human Services to develop the tables specified in the legislation in a way that would be considered valid by the scientific community?

Dr. BRANDT. Is there a way for us to do that?

The CHAIRMAN. I asked if you thought it was possible for you to do that.

Dr. BRANDT. Yes, I think it is possible for us to develop those radioepidemiologic tables in a manner that would be acceptable, but it is going to take some time. In the first place, we would certainly want to bring in as much representation from the general scientific community as possible in order to try not only to gain consensus but gain the necessary credibility.

The CHAIRMAN. I would think so.

How much time would you think it would take?

Dr. BRANDT. Let me ask Dr. Beebe who knows a good bit about this.

The CHAIRMAN. We are glad that you are here, Dr. Beebe.

Dr. BEEBE. I think it is really very hard to say. I think a time limit could be put on it and a result should be obtained within that time limit. I do think 6 months is a short period. I say this from having worked on the BEIR Committee and having struggled, particularly in the final stages of our work, over some very basic differences. I feel 6 months is probably a short period of time for the kind of expert group that you would necessarily have to bring together to create acceptable tables.

The CHAIRMAN. How about 1 year?

Dr. BEEBE. A year should be adequate or more than adequate.

The CHAIRMAN. In other words that would be even more than adequate.

Dr. BEEBE. Yes.

The CHAIRMAN. Can we count on HHS to do this?

Dr. BRANDT. Can you count on us to do it? If the Congress directs us to do it, we will do it.

The CHAIRMAN. Is there any reason not to do it now as a result of the issues that have been raised in this very important hearing?

Dr. BRANDT. I do not know of any reason not to begin.

The CHAIRMAN. I would encourage you to do it.

Dr. BRANDT. All right, sir.

The CHAIRMAN. Dr. Brandt, can you think of another method than the method we are considering here today for judging equita-

bly the claims of cancer victims who have been exposed to radiation?

Dr. BRANDT. Do I know of another method?

The CHAIRMAN. That would be more equitable than this.

Dr. BRANDT. I think the differences we might address with you or with your people would be the following. One, would be to try to differentiate among the types of cancer. As we pointed out for example, the differences between the development of a cancer of the thyroid versus the fatal form of leukemia are fairly significant in terms not only of monetary problems encountered by the victim but also the suffering of both the victim and family. As now drafted, the bill would provide greater compensation for thyroid cancer because it would have a higher attributable risk than leukemia.

Second, would be the issue of the level at which you would agree to compensation. That is what probability level you would want to set in order to try to determine whether or not a person should be compensated.

Finally, I guess one of our concerns is the tying of the level of compensation to a single percentage point of the probabilities in the table. We just do not think we can estimate them that precisely.

I think those are the sort of differences. The basic method is not something with which we have real disagreement.

The CHAIRMAN. OK.

Mr. Thompson, by including the veterans in the legislation I had no intention of either interfering with the good work of the Veterans' Administration or subverting the authority of the military. My aim was to insure that veterans received the same benefit of the doubt civilians would enjoy under this legislation. If the Veterans' Administration wants to do the job, that is fine with me, but I think the job should be done.

It seems to me veterans should not be discriminated against just because they were in uniform. I think you need to realize that this legislation is not designed to establish a pension or a maintenance program for anybody. It is meant to provide a single award of damages, a sum of money that is hardly exorbitant under the circumstances considering the various forms and pains of cancer.

If a few veterans receive $50,000 apiece or $100,000 under very special circumstances I do not see how this is going to subvert the Veterans' Administration. The VA could still make an independent assessment of each veteran's claim.

However, let me ask you this. How many veterans would be likely to win damages under this legislation in your opinion?

Mr. THOMPSON. First, if I may address your opening remarks, I think the fact is that the VA is doing the job already. You indicated that there is a need for us to do the job.

The CHAIRMAN. Have you compensated them?

Mr. THOMPSON. We certainly have.

The CHAIRMAN. In what way?

Mr. THOMPSON. We have awarded claims based upon——

The CHAIRMAN. Compensation claims based upon radiation exposure?

Mr. THOMPSON. Certainly. Based upon atomic weapons test participation, yes.

The CHAIRMAN. Would you provide us with a list of those to whom you have awarded claims and what the monetary awards amount to?

Mr. THOMPSON. Yes.

The CHAIRMAN. It may be if you are handling this we may not want to include the veterans, but it is my understanding that you are not handling it other than medically.

Mr. THOMPSON. I can tell you there have been at least 16 compensation awards involving cancer suffered by 1 former weapons test participants.

The CHAIRMAN. Suffered by a form of what?

Mr. THOMPSON. Excuse me?

The CHAIRMAN. There were 16 claims by veterans who suffered from a form of what?

Mr. THOMPSON. Cancer.

The CHAIRMAN. Radiation cancer?

Mr. THOMPSON. Some of the cancers certainly are known to be radiogenic.

The CHAIRMAN. You have already concluded at the Veterans' Administration that there are people who really did suffer as a result of the atmospheric tests and you have compensated veterans as a result of that?

Mr. THOMPSON. We certainly have. I am surprised that that is not more widely known.

The CHAIRMAN. I am just establishing it for the record. Go ahead.

Mr. THOMPSON. We have allowed 16 claims involving former atomic weapons test participants.

The CHAIRMAN. Again, are any of those 16 cases of compensation based upon the radiation they received while working in the atmospheric test area in Nevada?

Mr. THOMPSON. Yes, some are. Some of those cases involve cancers that began or became manifest in service or within the 1 year post-service presumptive period that is built into the law. Other cases, however, involve lengthy latent periods following exposure and lengthy latent periods post-service.

However, the judgment was made by the VA in applying its rules that a reasonable probability of service connection existed.

The CHAIRMAN. Would you provide for the committee each case that you attribute to radiation cancer as a result of the Nevada tests?

Mr. THOMPSON. Certainly.

The CHAIRMAN. Also all of the background material as well as the medical material pertaining to each person so compensated. Would you provide that?

Mr. THOMPSON. Yes.

The CHAIRMAN. How soon can you provide that?

Mr. THOMPSON. There have been——

The CHAIRMAN. Can you provide it within a couple of weeks?

Mr. THOMPSON. It may take us a little while to call in all the files which are scattered around the country.

The CHAIRMAN. We would like to have every document pertaining to that.

Mr. THOMPSON. I would say certainly within 3 or 4 weeks.

The CHAIRMAN. That will be fine. We will look forward to receiving that.

Go ahead.

Mr. THOMPSON. I have now forgotten the question.

The CHAIRMAN. Let me ask you one or two other questions.

What type of a standard did you require in order to assess compensation with regard to these soldiers you have compensated as a result of nuclear radiation contracted cancer?

Mr. THOMPSON. Our statutory authority permits us to compensate individuals whose disabilities were incurred or aggravated during service. The only standard we have—this surprises a lot of people—is a regulation of VA's creation that is known colloquially as the reasonable doubt rule. We will resolve any reasonable doubt in favor of the claimant, including any reasonable doubt regarding the issue of service connection.

The CHAIRMAN. I have a few constituents you and I have to sit down and talk about.

Mr. THOMPSON. Fine.

The rule appears in the Code of Federal Regulations at section 3.102 of title 38.

The CHAIRMAN. You understand, I am sure, that that is exactly what we are doing here. We are trying to resolve this very serious problem by giving those who suffer from cancer the benefit of a reasonable doubt.

Mr. THOMPSON. I do understand that. I am here to say that because the VA compensates in a manner similar to what is proposed, we think veterans should not come under the coverage of this new remedy.

The CHAIRMAN. Our legislation allows the courts to use classified information on behalf of the claimants. Does the VA have a method by which classified information can be used impartially on behalf of a veteran's claim?

Mr. THOMPSON. The dose information that we develop during the course of our adjudication of claims is usually supplied by the Department of Defense. We rely on the Department to handle any security problem.

There is no problem with our getting information from them regarding who participated in tests, what their reported film badge reading was, or what the reconstructed dose estimates are.

The CHAIRMAN. Thank you.

I personally appreciate both of you coming.

In closing this hearing, I think we have made a lot of strides here today. I think we have had testimony and agreement we have never had before. I do believe we are coming up with an approach that basically might solve this very horrendous problem. I just hope the administration will look at this approach for what it is and realize that this may be the only really effective yet legal and just way of resolving this problem.

I am grateful for all the witnesses appearing today.

With that, we will recess this committee and these hearings until further notice.

[Whereupon, at 11:30 a.m., the committee was recessed, to reconvene at the call of the Chair.]

O